Sustainable Supply Management

An empirical study in People's Republic of China

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Date: 18 April 2016

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1. Abstract

Objective
This thesis explores sustainable supply management in the People's Republic of China. This is trailing the call of Ageron, Gunasekaran & Spalanzani (2012) to conduct an empirical study on sustainable supply management (SSM) in alternative geographical areas following SSM research in France.

Methodology
Given the ever increasing vast amount of literature available, the method of systematic literature review has become an indispensable research method (Fettke 2006 p.257)
This literature review is used to research a conceptual framework proposed by Ageron, Gunasekaran & Spalanzani (2012). Based on the literature review and framework, an empirical study using survey research was completed in China. The survey questionnaire used to collect data in China contained 80 items and the provided 78 useful responses. In addition to the research of Ageron the model was empirically tested using the response data.

Framework
The framework used is proposed by Ageron, Gunasekaran & Spalanzani (2012). It is constructed on the basis of seven influencing factors on Sustainable Supply Management (SSM). (1) Reasons for sustainable SSM, (2) Criteria employed for SSM, (3) greening supply chains, (4) characteristics of suppliers, (5) managerial approaches for SSM, (6) barriers for SSM and (7) benefits and motivation for SSM. (Figure 1.1)

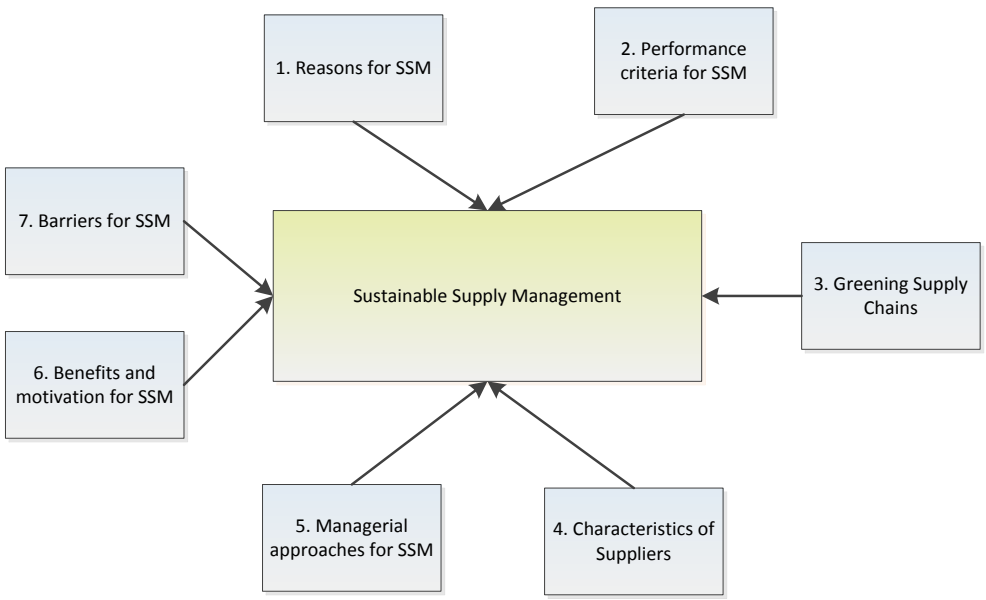

Figure 1.1 Model for sustainable supply management (source: Ageron, Gunasekaran & Spalanzani, 2012)

Results
The framework was used to review and empirically test whether sustainable sourcing enhances the initiative for sustainability in the upstream supply chain. This was done from the perspective of suppliers through perceptions of China based enterprises on the subject of SSM. The China questionnaire feedback is reviewed and compared to the results found in

France by Ageron, Gunasekaran & Spalanzani (2012). Conclusions and suggestions for further research are discussed on the development of the proposed framework.

Discussion
To a large extent Supply Chain Management (SCM) has been practitioner driven (Burgess, Singh & Koroglu, 2006). An extensive SCM literature research revealed a substantial disparity between the scientific sustainability dialog and its practical application. (Ashby, Leat & Hudson-Smith, 2012) This thesis builds on the research of Ageron cs. to research the current state of SSM in China.

Conclusion
Compared to the study conducted by Ageron, Gunasekaran & Spalanzani (2012), similarities and differences between France and China do surface from the survey. In both geographical areas, principal expected benefits from SSM in China are along traditional topics of customer satisfaction, supplier innovation, capability and trust. Further, in the two countries the drive for enterprises to involve themselves in sustainability is found in both internal and external factors. Top management, both in the focus organization and the supplier plays a key role in progressing sustainability. In China it appears the external factors are significant influencers of SSM. Authorities have increased legislation and stimulated companies to certify for ISO14001. Reduction of carbon footprint also encounters a high interest in China, which tries to deal with its widespread airpollution issues. At the same time, the actual execution and enforcement of legislation seems not to be at par with further developed economies like France. Similar to France the traditional selection criteria of quality, price and reliability surface as the most constituent criteria in the supplier selection process.

In both France and China SSM is influenced by business characteristics. Larger companies are preferred over SME's to develop SSM. A difference in China is the take on business relationships named G*uanxi.* This could possibly be an instrumental element for improving SSM. Equally, the strong expectation found in China on financial benefits stemming from SSM is a differentiator, worth further investigation. Finally, the maturity of NGO's in China is relatively low, hence strengthening their influence could lead to higher pressures on China based companies to improve sustainability achievements.

Research limitations/implications
Chinese literature on the subject of sustainability has not been reviewed, though this could be beneficial in research of Sustainable Supply Management in the Peoples' Republic. Further research using Chinese language journals is therefore encouraged. Conducting interviews to support the survey could provide more insight in possible interpretation issues. Face to face interviews next to running a questionnaire possibly could improve the outcome. Given the vast number of China based manufacturers subsequent research is obviously desired.

Future research
Further research is proposed on sustainability in relation to the used model, Chinese legislation and legislative enforcement, the impact of traditional Chinese business relationships on sustainability and financial drivers for China based enterprises to embark and improve on SSM. Lastly, analogue to Ageron, Gunasekaran & Spalanzani (2012), it is suggested to conduct an empirical study in various Chinese regions to explore if the model used in the study would present differences per region within the country.

Originality /Value

China faces vast challenges when it comes to sustainability. The interest on the topic is large and on the increase within the Chinese party authority, not the least due to a rising awareness amongst the people across the republic on the environmental challenges the country is currently exposed to. This is compounded by both national and international pressures on China to address the present and increasing sustainability issues in what is often referred to as the 'world's factory'.

Where sustainability research on supply management has received limited attention, this work is one of the few and pioneering efforts to investigate SSM practices in China.

2. Introduction

With the continuing global financial crisis since 2008, results of companies are impacted in a negative way (Christopher & Holweg, 2011). Enterprises, especially Transnational Corporations (TNC's), face an enlarged geo-scope due to increasing globalization, boosting Supply Chain Management (SCM) complexity with an upsurge of related risks (Schary & Skjøtt-Larsen, 2001 ; Christopher, 2005, p. 235)
In the midst of this already challenging business environment, authorities invigorate environmental and labour legislations, amongst many other external greening presures (Zhu, Geng & Sarkis, 2016). Stakeholders demand transparency on responsible entrepreneurship given initiatives launched in the last decade on sustainability, such as the FTSE4GOOD 'Dow Jones lead SAM sustainability index' and the 'global reporting initiave'. This drives an increasing need for enterprises to run a sustainable business, transparent to the public.

Possibly the most quoted and known definition of sustainability is the one by the Brundtland Commission: "development that meets the needs of the present without compromising the ability of future generations to meet their needs." (Brundtland, 1987, p.8).
Under the surface of this more generic definition, sustainability is often referred to as an integration of social, environmental and economic issues (Teuteberg & Wittstruck, 2010). Elkington (1998) forged these elements together and introduced the concept of the 'triple bottom line'.

With the increasing pressure from authorities, customers, suppliers and competitors in the business context, the significance of sustainability in company strategies has equally increased (Zhan, 2016; Zhu, Geng & Lai, 2010) and has even become a fundamental principle of 'smart management' (Savitz &Weber, 2006).

Translating strategy into operational execution, including policy on sustainability finds its way into day to day actions through supply chain management. At the start of the century Supply Chain Management was defined by Christopher (2005) as "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole". Whilst retaining these rudimentary core values, the evolution of the Supply Chain Management definition resulted in a broader and more encompassing view of the field (Stock & Mulki, 2009).

According to Groose (2000) the goal of supply chain management is ultimately to achieve greater profitability by adding value and creating efficiencies, thereby increasing customer satisfaction. The three elements captured in this definition, value creation, efficiency increase and customer satisfaction, comprise the benefits resulting from effective implementation of supply chain strategies (Stock & Mulki, 2009). Supply chain management has thus become an important factor in the competitive approach for organizations (Zhu, Sarkis & Geng, 2006) by seeking synchronization and convergence of intra- and interfirm operational and strategic capabilities into a unified, compelling marketplace force (Ross 1998). In the suppliy chain the relationship with suppliers play an eminent role in improving sustainability (Kumar & Rayman, 2015).

In this setting, the topic of sustainability emerged in the significance of SCM, as demonstrated by Bettley & Burnley (2008) by explaining the strong influence which SCM has in the decision making process, and that it is therefore critical that the supply chain function embraces the requirements of sustainability management. Teuteberg & Wittstruck (2010)

endorse the importance of the SCM concept, lending itself to be extended with the sustainability concept. As such, SCM stretches into the area of sustainability and instigated the emergence of sustainable SCM (sSCM). It is argued that sustainability in enterprises is to be established as a compulsory, integral, part in their supply chain management. (Ageron, Gunasekaran & Spalanzani, 2012)

Carter & Rogers (2008) capture the symbioses of sustainability with SCM in their sSCM definition of *'the strategic achievement and integration of an organization social, environmental and economic goals through the systemic coordination of key inter organizational business processes to improve the long term economic performance of the individual company and its value network'*

sSCM involves the long-run improvement of an organization's economic bottom line and helps managers to answer the question of, "What is it that we need to do, not just to survive, but to thrive, and not just one year, three years, or five years from now, but in ten years, 20 years, and beyond?" (Carter & Liane Easton ,2011). This conceptualization allows organizations to make tangible efforts, but as far as economic aspects are concerned, researchers have to deal with one prime question; Can a sustainable supply chain be profitable? (Teuteberg & Wittstruck, 2010). More specifically, do firms which engage in sustainable supply chain management (sSCM) practices attain higher economic performance than firms which concentrate solely on economic performance? (Carter & Rogers, 2008)

This crucial problem entails further questions on performance measurement around sustainability. How and with which key performance indicators can sSCM be measured? Which cause and effect relationships exist between Sustainable Management and long-term financial success? (Teuteberg & Wittstruck, 2010). In search of business excellence, performance improvements need to be monitored. By alignment of goals between the interrelated departments "silo" mentality would be eliminated, resulting in a streamlined organization (Lapide, 2005). The importance in organizational performance is also addressed by Wahlers, & Cox (1994). It is suggested that the relation between the functions can be established by competitive factors and performance measures. Bettley & Burnley (2008) underline the importance of the adoption of a closed loop supply chain in driving operational decisions, and choices made in operations management do strongly influence sustainability impacts. Supply chain management is therefore equally important to integrate the conventional operational performance indicators with appropriate sustainability measurements.

Nonetheless, the business case approach motivated by economic sustainability only is not adequate for the overall sustainability of an enterprise (Dyllick & Hockerts, 2002). Next to an economic sustainability perspective, the elements of Environmental and Social sustainability are to be added to form the 'triple bottom line' which serves as the sustainability foundation of an enterprise. (Elkington, 1998). This broader view on organization sustainability which consists of the three elements of economic, environmental and social performance elements is found throughout literature.

That companies would offset the pressure they contract on the triple bottom line performance onto partners in the supply chain, was recognized by Elkington (Halldórsson, Kotzab & Skjøtt-Larsen, 2009). Upstream partners, i.e. suppliers, are judged to be increasingly involved in sustainability matters (Ageron, Gunasekaran & Spalanzani, 2012). This observation is the

basis for the empirical research on sustainable supply management conducted by Ageron c.s. in France.

Ageron, Gunasekaran & Spalanzani (2012) constructed a model to research sustainable supply management in France on the basis of seven influencing SSM factors; (1) Reasons for sustainable SSM, (2) Supplier selection criteria used, (3) greening supply chains, (4) characteristics of suppliers, (5) managerial approaches towards SSM, (6) barriers for SSM, and (7) benefits and motivation for SSM.

Following the call by Ageron cs. to conduct research on the model beyond the geographical area of France, this thesis explores the theoretical SSM framework in China.

The Peoples' Republic of China, with the largest population on the globe, has experienced rapid economic growth in the past decades. This has moved the country to become the second economy worldwide and be known as the 'worlds' factory'. This phenomenal economic achievement has nevertheless been accomplished with vast and far reaching negative side effects, leading to a distorted triple bottom line; China is still critiqued to be amongst the worst polluters in the world (Bai, Sarkis & Dou, 2015; Yale, 2014). On social responsibility it also faces large concerns attracting global attention (Bai, 2015; Lin, 2010).

Growing in importance for the world economy, the global attention and pressure on China is also increasing. In response, Chinese authorities increased their attention for legislation, policies and certifications (Hou & Li, 2014). Nonetheless, the large challenges ahead constitute considerable concerns for the future of the country.

The above constitutes the motivation for further research on the conceptual model of Ageron cs. and to conduct a questionnaire for an empirical study on Sustainable Supply Management in China.

3. Literature review

Supply Chain

Logistics has evolved into Supply Chain Management (SCM) through integration of the inter-corporate material and information flow management (Handfield & Nichols 1999).

The conventional perception of SCM was its proficiency to leverage suppliers to obtain the lowest possible purchasing cost and safeguard supply (Ashby, Leat & Hudson-Smith, 2012). The definition by Lambert & Cooper (2000) captures the evolvement of importance and scope of SCM in which it covers the full chain from corporate vendors to customers, with the objective to 'integrate the key business processes that provides products, services and information that add value for customers and other stakeholders'.

Over time SCM gained importance in both horizontal and vertical business integration, as is conveyed in the definition by Mentzer et al. (2001, P.18), 'the systematic, strategic coordination of traditional business functions and the tactics across these business functions within the supply chain, for the purposes of improving the long term performance of the individual companies and the supply chain as a whole'.

In the contemporary business environment, supply chains are in mutual competition, rather than individual enterprises. (Gold, Seuring & Beske, 2010; Christopher, 2005). Regardless, recent SCM definitions all appear to hold a number of key elements and emphasize the importance of co-operation, coordination, integration and collaboration, in combination with its cross disciplinary nature (Frankel, Bolumole, Eltantawy, Paulraj & Gundlach, 2008 ; Mentzer, Stank & Esper, 2008).
Lambert & Cooper (2000) capture the amalgamation of these aspects in their definition referring to 'the integration of key business processes from end-user through original suppliers, that provides products, services, and information that add value for customers and others stakeholders'.

More recently, a large and consistent body of literature exists dealing with sustainability in supply chains. This indicates the importance of measuring the sustainability of SCM (Ageron, Gunasekaran & Spalanzani, 2012; Preuss, 2005 P113) endorsed the importance of sustainability whilst observing a shortfall in SCM; 'A corporate function of increasing economic importance, but one that is not pulling its weight on environmental protection'.

Notwithstanding this observation, publications on sustainability in combination with SCM go back as far as 2003 (Ashby, Leat, & Hudson-Smith, 2012). The combination of Supply Chain Management (SCM) and sustainability has ultimately culminated in 'sustainable SCM', or sSCM. sSCM portrays the strategic, transparent integration and achievement of an organizations' social, environmental and economic goals in the systemic coordination of key inter-organizational business processes for improving the long term economic performance of the individual company and its supply chains. When coupled with economic objectives to develop a clear, long term strategy, the inclusion of SCM activities in a firm's sustainability can actually create a longer lasting and less imitable set of processes (Carter & Rogers, 2008)

Sustainability

The definition on sustainability of the Brundlandt commission (Brundtland ,1987) is an often quoted one:

> *"development that meets the needs of the present without compromising the ability of future generations to meet their needs."*

This succinct definition has an extensive reach which challenges companies to identify their role in the broader macro-economic perspective (Shrivastava, 1995b ; Stead & Stead, 1992) Most of the conceptualizations found in literature do focus on the ecological aspect of sustainability. Nevertheless, apart from the impact on the environment through worldwide economic activities indicating the necessity to conserve non-renewable resources, the Brundlandt definition also holds the tenet of 'needs'. More specifically, the needs to secure food supplies and safeguarding basic human needs are also part of the realm of sustainability (Carter & Rogers, 2008). Within the business scope, sustainability is also focused on ensuring the long term existence of the enterprise; the financial or economic sustainability.

Correspondingly, literature suggests that sustainability refers to the integration of social, environmental, and economic attributes (Carter and Rogers 2008) (Figure 3.1). The assimilation of the environmental and social/ethical performance with the more traditional financial bottom line has been captured explicitly by Elkington (1998) in what he refers to as the triple bottom line paradigm. The expansion beyond the financial reporting of public companies appears to be novel and concurs with the contention of stakeholders towards enterprises on the anticipated ability to measure, audit and report business performance on all three dimensions of sustainability (Norman & MacDonald, 2004).

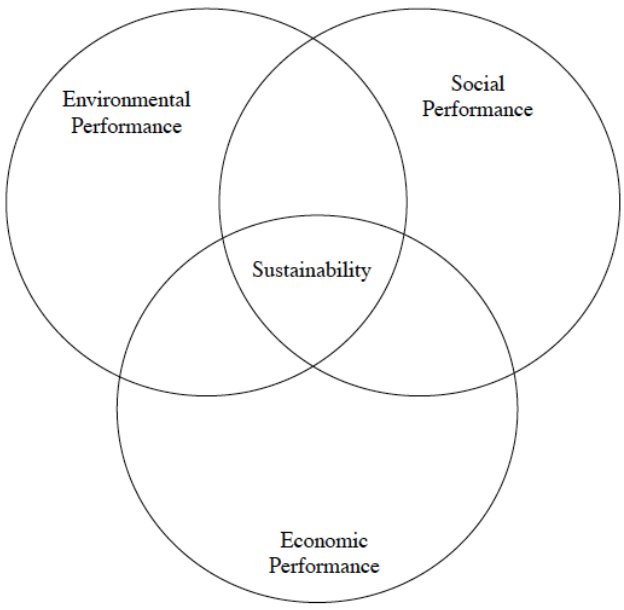

Figure 3.1 Three dimensions of sustainability. (Carter & Roberts, 2008)

Governments have selectively exerted legislation on corporations to mitigate sustainability issues. Boosted by the interest of stakeholders in the sustainability arena, also commercial initiatives have emerged. Launched in 1999, the Dow Jones Sustainability Index (DJSI, 2015) is the longest running global benchmark on company sustainability and beholds a family of indexes evaluating the sustainability performance of the largest 2,500 companies listed on the

Dow Jones. Commercial initiatives like the DJSI have attracted attention of stakeholders in the business context and reciprocally attracted interest of companies to work on their sustainability agenda. At the same time it should be recognized that companies do hold a significant influence over economic activities. Initiatives by governments and consumers alike should thus be enhanced by enterprises, as these have the resources, the technical know-how and established capacity to drive the sustainability agenda. (Shrivastava, 1995c). Correspondingly, with these implications in mind, there are evident advantages for corporations to embrace the wider sustainability theme. By following the cradle to cradle philosophy, process efficiencies will increase, hence drive down waste and thus decrease operational costs. As a result companies also have the ability to become more sustainable on the financial front. Corporate Social Responsibility (CSR) initiatives will aid in lifting the enterprise image and make them more socially acceptable, gaining legitimacy. Customer demand for environment friendly products is growing, which provide companies going 'green' a competitive advantage. This advantage can be amplified by positioning the enterprise in a leading position amongst its peers. By addressing the long term resource depletion issues and health risks from ecological pollution in an early stage, the risks of putting a burden on 'future generations' can be mitigated. By doing so, this allows firms to preempt, or even promote regulations, in favoring own technologies over competition. Consumers are increasingly assertive and demand eco-friendly products and company policies alike. Greening their strategies and execution methods will provide companies with an enhanced competitive edge. (Shrivastava, 1995b, Shrivastava, 1995c, Winsemius 2013 P58-61)

Yet there seems to be limited guidance on how to identify future sustainability needs (Shrivastava, 1995c). Organizations not only find it difficult to deploy policies on the all-encompassing definition of sustainability, which comprises the triple bottom line (Carter & Rogers, 2008), but also encounter difficulties in balancing the ecological, macro-economic and societal attributes in setting out their strategies. This is for instance perceptible where the need for investments emerges or cultural barriers do restrain companies in entering the path of sustainability. Furhtermore, in the triple bottom balancing act, multiple stakeholders such as shareholders, employees, other organizations in the supply chain, and parties in the broader context of the organization including society and the natural environment need to be taken into account (Hart, 1995; Starik & Rands, 1995).

With this in mind, around overall business sustainability a number of best practices can be recognized, but for it to work there needs to be adherence to a number of principles. In the first place in-control and measurement need to be at the heart of any company. Sound procedures to collect and collate information must be in place taking obligatory legislative reporting into account. This requires a properly balanced reporting design effort to not asphyxiate the enterprise in an overstated amount of rules and regulations. An example of a well-recognized report standard is the 'Global Reporting Initiative'. Second, transparency needs to be safeguarded through reporting and disclosure. Measurement and control are core values of instituting sustainable practices. Furthermore, environmental management systems like ISO14001 provide a structural framework for suitable environmental management. Besides collecting and collating information, organizations need to be entirely transparent with external parties, for instance through the above mentioned 'Dow Jones sustainability index'. Active engagement of stakeholders also involves an 'outside-in' approach. Through joint decision making, the enterprise is encouraged to call upon its learning capacity and is challenged to understand both stakeholder requirements and resistance. Third, a strategy based on a systematic analysis of the environmental, social and economic impact of the

company and its product portfolio is a precondition to drive and make vast progress on the sustainability agenda.

Performance measurement

From research it is apparent that through driving the sustainability agenda organizations can improve their resilience and economic performance (Carter & Rogers, 2008) which makes the sustainability journey for corporations attractive. The strategic imperative to integrate across functions and organizations has caused many firms to focus attention on SCM- ;"the systematic, strategic coordination of traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purpose of improving the long term performance of the individual companies and the supply chain as a whole" (Mentzer & Williams, 2001). Abbasi & Nilsson (2012) argue that, sustainability should be integrated into SCM and not be treated as a concept or theory of its own. Within this realm, environmental and social issues should be treated in the same way as revenues and costs are today.

This is not an easy task, as the menaces in SCM planning and execution process are the time lags and occurring events which hamper the achievement of business objectives. This generates gaps between what was planned and what actually is done. To achieve high performance supply chain management, continuous efforts need to be made to close these gaps. Chae (2009) suggests the deployment of performance metrics to offer the necessary supply chain visibility and offer the opportunity to identify and address potential issues.

Integration aspects

Sustainability, especially where it concerns the social and environmental aspects, occurs on the interface of the business and its context. Integration of the enterprise with the business context is therefore key. Apart from external integration across enterprises and their environment, also internal integration has been revealed to positively influence the performance of the enterprise (Oliva & Watson, 2011).

Of all supply chain integration dimensions, the internal integration in companies has proven to be of the most important influencing factor on performance. A higher degree of internal integration in companies is argued to lead to a higher degree of customer and supplier integration. (Huo 2012 ; Stank, Keller & Daugherty, 2001; Zhao, Huo, Selen & Yeung, 2011). Conversely, the lack of internal integration will hamper external integration and with it the successful implementation of sustainability. Firms with a weak internal integration generally face difficulties in sharing information, often caused by working in silos in the company business disciplines. A lack of integration occurs when decentralized decision makers disregard the optimal objectives due to a lack of information or conflicting incentives (Oliva & Watson, 2011) In such environments the sustainability objectives across functional processes are easily lost.

There are companies which, after achieving the easier sustainability benefits, have made long term investment commitments and find themselves in a situation where conventional and environmental criteria are not necessarily in harmony. (Gray 1994, P47). Further to this statement, Teece, Pisano & Shuen (1997) argue that companies should adapt, integrate and reconfigure both internal and external integrative capabilities to match the requirements of a rapidly changing environment. Supply Chain integration enhances the understanding of each other's business and is helpful for Supply Chain partners to form new routines. (Huo 2012)

Huo (2012) asserts that organizational capability from a SCM perspective has a positive effect on internal and external integrative capabilities. Integrative capabilities are major drivers for company performance. This means that the success of an enterprise is dependent on well managed SCM processes. Process in this perspective is defined as a 'sequence and interdependency of activities designed to achieve a goal'. This systemizes and standardizes organizational learning on actions and decisions (Oliva & Watson, 2011). This is difficult to match by an approach merely based on responsibilities and structure. Oliva & Watson (2011) also present evidence that achieving alignment in the execution, i.e. integration of plans can be more important than informational and procedural quality. Hence a process in which a series of coordinated reviews lead to the orchestration of strategic, operational and financial plans is complementary to the integration levels reached in an organization.

First-rate supply chain management requires planning and execution excellence that transcends company borders (Anderson, Britt & Favre, 2007). This perspective proposes that horizontal integration is of importance. When deploying a channel-wide vision all nodes in the supply chain are involved, providing transparency amongst partners on information needs like customer demand patterns, promotions, restocking algorithms and capacity constraints. When extending this view to parties in the business context, the consensus plans can be joined along the supply chain and external integration could be amplified.

The above stresses the increasing importance of successful collaboration with internal and external parties to tighten integrated relationships.
Initiatives like the Supply Chain Operations Reference model (SCOR) support the internal integration of companies. High level, four fundamental stages are identified in the supply chain process (Fleischmann, Meyr & Wagner, 2005): Procurement, production, distribution and sales. In the SCOR model, the supply chain process terminology is reflected in the Plan, Source, Make, Deliver components, to which Return was added at a later stage. Traditionally these elements where managed independently. SCOR allows for a lower level of complexity in the decision making process, but has its repercussions as it disregards the interactions of different stages. This lack of integration leads to sub-optimal results in the search of cost reductions and profitability. Looking for improved competitive advantages, enterprises are addressing the decoupled decision making processes and steer the supply chain process towards integration of planning and control activities. (Feng, D'Amours & Beauregard, 2008)

This gradually extended into the amalgamation between individual supply chain partners, in literature also referred to as Collaborative Planning Forecasting and Replenishment, (CPFR) (Thomé, Scavarda, Fernandez & Scavarda, 2012), enforcing external integration. The CPFR process fosters interconnected business planning by the individual entities in the chain. This delivers competitive advantages, for the individual enterprises as well as for the collective chain in support of sustainability. The contention here is that CPFR and SCOR strengthen coherence of decision making processes in the supply chain on the inter-relationship of companies. This implicates multiparty ownership of decisions and responsibility for results. (Stank, Keller & Daugherty, 2001).

Research suggests that increasing levels of integration lead to improved business results (e.g. Feng, D'Amours & Beauregard, 2008). Nevertheless, actually achieving integration appears to be a difficult challenge in the business environment. This is an exigent task and requires top down orchestration and a strong change management process to change behavior and incentivize action (Wallace, 2004; Wight, 2000; Bossidy, Charan & Burck, 2011; Ling & Goddard, 1988).

According to Stank, Keller & Daugherty (2001), service performance is positively influenced through collaboration with external supply chain entities, which consequently results in improved internal collaboration. Through external collaboration, valuable information can be obtained, such as inventories, point of sale order patterns, planned promotions, etc. for performance enhancement. Collaborative Planning, Forecasting and Replenishment (CPFR) concepts are designed for exactly this purpose. Feeding back information into the organization, internal collaboration is just as much of importance, to reach the right employees and follow through. This facilitates close interactions, bringing superior expertise to operational execution levels with focus on activities and resources as required (Stank, Keller & Daugherty, 2001).

As in SCM, a similar struggle is noticeable in the sustainability arena. Whilst researchers suggest that through driving the sustainability agenda organizations can improve their resilience and economic performance, many companies appear to have trouble with implementation of the triple bottom line. (Epstein & Roy 2001). Literature suggest there is evidence that changes in senior management and lost tenacity in follow up of the corporate strategy can easily terminate corporate social responsibility initiatives. The sustainability agenda is equally sensitive to these detrimental influences leading up to a lack of strategy deployment, a lack of integration, coordination, and adequate measures to curb failure to follow through in heart beat frequencies. In the comprehension of how to facilitate the required behavioral change in the organization, the external to internal collaboration relationship could be a crucial element. This implies that collaborating with customers and suppliers is a first step towards effective collaboration within the enterprise. (Stank, Keller & Daugherty 2001),, The same implication could be true where it concerns the triple bottom sustainability subject.

Similarly to the supply chain stage management, with the diversification of tasks in enterprises, departmental silos have evolved over years, with equivalent incentive schemes. Especially the two core business functions of sales and operations are traditionally not well coordinated (Feng, D'Amours & Beauregard, 2008).

The need for Strategy

The pursuit of greater economic efficiency, social equity and environmental accountability to "meet the needs of the present without compromising the ability of future generations to meet their own needs." is in need of a long term focus and calls for strategy.

Although Peter Drucker (1909-2005) considered strategy to be a commodity, this seems to ignore the six strategic positioning principles established by Porter (1996).

According to Porter, the very first objective of any strategy is to obtain sustained profitability, followed by a set of unique value propositions. This is necessary to empower an enterprise to compete. Third, tailored to these value propositions, a distinctive value chain is to emerge from the way processes are designed. Trade-offs also need to be made, since doing 'everything for everyone' constructs a barrier in obtaining a true advantage over competition. The fifth principle prescribes that activities in a company need to be mutually reinforcing, and finally a continuity of direction in the strategy needs to be maintained to strengthen the value propositions overtime.

Formulating a holistic sustainability strategy is based on similar principles, where business activities are identified which do have significant impacts on sustainability issues. (Epstein & Roy, 2001). A few examples of such issues are employee diversity and inclusion, carbon dioxide emissions, labor practices, energy and water consumption and waste volumes. Obviously, to maintain focus in the broad spectrum of sustainability issues, the goals and related business metrics will need to be narrowed down and balanced.

Following the accomplishment of a sustainability strategy, the implementation part comes into play. Literature indicates that translating a sustainability strategy into action and driving it through a complex organization is a substantial challenge (Epstein & Roy, 2001; Bossidy, Charan & Burck, 2011). In recent decades, globalization has further increased the required effort in establishing a sustainability strategy. Transnational Corporations (TNCs) do face the need to make choices around implementing a 'one size fits all' approach or to adapt the strategy to local requirements. In this perspective, ongoing globalization also brings increased complexity on supply chains and impedes supply chain adaptability. In combination with a lack of an integrated approach, auxiliary complexities are easily introduced.

As Hoole (2005) asserts, in the actual deployment of the supply chain strategy the number one priority is to curb the complexity dilemma. This can be achieved through a solid SCOR planning process in combination with aspects to introduce of organizational optimizations.

At the surface this may seem trivial, but a reciprocal relationship between the strategic planning and its execution, the connecting tactical level is an eminent part to be well embedded in the organization. This is to ensure strategy execution and subsequent monitoring are actually followed through and the operational processes are in line with the direction of the strategy. By introduction of a closed loop system, a frequent strategy optimization can be achieved through feedback using key performance indicator results. This will enhance the firm's opportunity to outrun and keep ahead of the competition over time. That is, for other organizations it will be more difficult to instantly imitate its strategy and thus the enterprise can better sustain its competitive advantage. (Grant, 1991)

Business sustainability thus is more than managing the triple bottom line, the economic, social and ecological risk aspects, sometimes also denoted as profit, people and planet. It also represents integration, collaboration and coordination through shared strategies and performance measurement mechanisms amongst supply chain partners on the triple bottom line. Moreover, it captures the time element which epitomizes business sustainability. A proper execution strategy keeps the enterprise on course and makes it resilient on the long run to changes in the business environment. Organizations with a well deployed business sustainability adhere to sustainable development and as such add economic value, are beneficial to ecosystems and build durable societies.

Sustainability in China

An imbalance in the triple bottom line has far reaching consequences. This is probably best illustrated in emerging and mid income markets, which are struggling with extensive environmental pollution amidst a buoyant economic growth era (Lo & Marcotullio, 2001). Possibly the largest eye-catcher being China.

Current sustainability issues in China are vast and complex. Reports around the deteriorating environment and its consequences the country is facing, are numerous. This ranges from air and water pollution, 'cancer cities' – Cities with a significant amount of the population

suffering from the same kind of cancer or where an increase of cancer incidences is experienced- to devastations caused by floods and droughts not in the least triggered by human interference with nature.

In a recent assessment on environmental sustainability the country ranked 118th amongst 178 countries (Yale, 2014). Although leaving India behind in the index, Brazil, Russia and South Africa all collected scores higher up the ladder when compared to China. China particularly attracts a lot of negative media attention when it comes to air quality. It experiences the world's worst performance for average exposure to fine particulate matter (PM2.5). (Yale, 2014)

Industrial pollution, flawed sewage systems, pesticides and chemical fertilizers used for agricultural purposes take their toll. Data from the Ministry of Environmental Protection of China collected from monitoring sites across China cities indicates that the underground water in 57% of the monitoring sites was polluted . Because of severe pollution problems with fresh water reserves around 200 million people have no access to drinking water that meets the national standard (Wu, Yang, Liu, Ma & Gao, 2015).

Annually 1.9 billion tons of coal is used in China, providing for 70% to 75% of its energy needs. In China vast quantities of particulate matter are released into the atmosphere due to coal burning, such as polycyclic aromatic hydrocarbons, sulfur dioxide, arsenic, and mercury. Petrol fueled vehicles emit nitrogen dioxide and benzene next to particulate matter and polycyclic aromatic hydrocarbons, taking their toll on health and life expectancy (Millman, Tang & Perera, 2008; Zhou et al., 2014).

Problems on sustainability in China are largely tied to interfering with nature through the perusal of economic development. Over the last six decades sustainability in China has been impacted both positively and negatively, be it overall more adverse then constructive. The nation has undergone major changes over the past era from which tragic examples emerge on how government interference affects sustainability in a harmful way.

In the 'Great Leap Forward' movement (*Dà yuè jìn* -大跃进, 1958–1961) 10% of forests were destroyed (Shapiro, 2001). The following campaign organized by Mao Zedong in 1963, the 'Learn from Dazhai in Agriculture' (Nóngyè xué Dàzhài, -农业学大寨) which lasted until 1978, ignited the restructuring of many landscapes and transformed an immeasurable number of lakes, marshlands, and shorelines suiting agricultural purposes with little concern for topographic, climatic, and socioeconomic conditions (Zhu & Sarkis, 2007). To modernize China's industry and boost China's economy, Deng Xiaoping initiated his 'open door policy' (*gǎigé kāifàng* 改革开放) in 1987. As part of the policy, special economic zones were set up, and foreign investments were welcomed. This is generally considered as the pivotal moment in China's economic fortune that put the country on the path to become 'The World's Factory'. Triggering mass production and stimulating foreign trade has since spurred economic growth, leading to further resource depletion and pollution to the detriment of the environment.

Nevertheless, for generations, the main focus on sustainability in China simply has been related to the extinction of famine. The distribution of resources across the country and social levels in the society resulted in large scale urbanization and mass migrations. For many life has much improved, and following Mao's open door policy a staggering 400 million people

have been lifted out of the lowest poverty levels since the 1980's and a prosperous Chinese middle class was established (James, 2001).

The large population of the country is a further challenge to the sustainability matter, with an overpopulation often perceived as a major cause of the environmental problems which China is facing (James, 2001). Moreover, in rural areas compliance levels to family planning policies introduced in 1979 is low. In 2014 the party announced to further relax its one child policy. The continued growth of the People's Republic population puts the resilience and sustainability of the nation to the test. As more people are born they require more resources and consequently more resources are taken out of the environment. This unrestrained growth has come with devastating effects on the environment, rampant corruption and latent social unrest, prompted by a widening gap between the rich and the poor.

Apart from a population increase, China is also facing large scale urbanization and growth of cities (Table 3.1). This urbanization is a manifest result of the industrialization policies China is following to urge GDP growth. In the first half of the previous century China had seen little urbanization. Mid-century onwards China experienced six stages of urbanization following different patterns. (Shen, Cheng, Gunson & Wan 2005). The first stage included reforms to spur industrialization and brought masses of peasants to cities and towns to take up work in mining and industrial enterprises. By 1957 urbanization had increased in the preceding eight years from 10.6% to 15.39%. During the 'Great Leap Forward' large numbers of people relocated to cities to be employed in the fast upcoming iron and steel industry. The Chinese government started to counteract this overly rapid urbanization in 1961. Through enforcement of industrial regulation, urban population was reduced by more than 20 Million people in just 4 years.

Urbanization was stagnant during the agricultural reform period. The cultural revolution (1966-1976) pushed the national economy and social system to the brink, and was followed by a renewed rural reform. This reform promoted rural economic development, concurrently enhancing non-agricultural economy and urbanization. By 1983, 21.62% of the population lived in cities. (Shen, Cheng, Gunson & Wan 2005).

This urbanization has greatly accelerated from 1985 onwards, and at present the urbanization percentage is around the 40% mark. This number is expected to increase in the coming decades. (GCS, 2015)

			2020	2030	2040	2050
Forecast 1	Total Population	(100 million persons)	14.9	15.3	15.4	15.3
	Urbanization rate	%	55.03	60.78	64.94	68.63
Forecast 2	Total Population	(100 million persons)	14.54	14.96	15.05	14.78
	Urbanization rate	%	56.40	62.17	66.45	71.04
Forecast 3	Total Population	(100 million persons)	14.72	15.25	15.44	15.22
	Urbanization rate	%	55.71	60.98	64.77	68.99

Table 3.1 Various population and urbanization forecasts of China from 2020 to 2050 *)

*) Source: Forecast 1: The modest forecast option in Study on China Energy Strategy (2000-2050). Forecast 2: The second option of China's Population Forecast by the United Nations. Forecast 3: the forecast of China's Population Development by the center of China Population Information Research.

Exploited resources such as minerals and energy are prime elements for development and urbanization and do have their impact on sustainability now and in the future (Shen, Cheng, Gunson & Wan 2005).

In the context of urbanization, sustainability holds several implications. The urban development itself can only be supported through providing sufficient energy and resources to greater efficiency. This is to be done in an ecologically responsible way with a connotation of activities projected to the future carrying capacity of municipalities avoiding negative environmental impacts for the next generations. It also means there is a social responsibility to ensure a fair distribution of income, power and resources in keeping up social peace. (Shen, Cheng, Gunson & Wan 2005).

Evidently China needs to address a large number of issues on the sustainability agenda and has arrived at a new critical point in time to address disparities and serve the needs of its growing population. Shen, Cheng, Gunson & Wan (2005) argue that China is to face long term resource shortages when urbanization increases beyond the current predictions. This calls for a drastic alteration of the current methods of resource management, which cannot be done without the aid and intervention of the government to revolutionize policy on sustainability.

Although sustainable development has been a national strategy since 1994, the priorities were set on economic growth (Liu, 2010). It is only recently that comprehensive environmental policies and targets have become the focus of the top-leadership. The persistent media attention paid to staggering levels of air pollution in major Chinese cities like Beijing and Shanghai has pushed the government to ramp up efforts to tackle this problem. It is not since the beginning of 2014, that the 15,000 largest State-Owned Enterprises (SOEs) are required to release real-time data on air and water pollution. SOEs historically have been some of the least transparent and often greatest pollution offenders. (Yale, 2014)

This compulsory disclosure follows the announcement of ‘air pollution control and responsibility’ contracts to hold provincial leaders responsible for meeting strict reduction targets, as well as a $277 billion dollar air pollution control plan released mid-2014, which prohibits new coal-fired power plants in some areas. The near real-time response with which the government has responded to hazardous air pollution events with vigilant monitoring, an $81 million USD smog lab, harsher penalties for smog offenders, and previous action on sulfur dioxide is impressive. Whether these efforts will result in tangible, measurable, reductions in air pollution for the millions of citizens living in China is yet to be seen, but because of these recent measures, China is considered a leader where it comes to taking corrective actions to address climate change by making progress on carbon intensity. Yet it leaves no doubt, the demand for better air quality is on the increase and some civilians even go as far as to sue local governments for it.

4. Methodology and Framework

Methodology

Conceptual theory building methods can create a balance between inductive and deductive reasoning and research and can help academics to lead and guide managerial practice (Meredith, 1993). The model proposed by Ageron cs. (2012) is used as the basis to investigate the state of sustainability in the upstream supply chain.

Given the vast and ever increasing amount of literature available, which is also easily retrievable through the internet, the method of systematic literature review has become an indispensable research method (Fettke 2006 p.257). A four step approach was adopted to select and retrieve relevant literature (i) identification of keywords ii) search of articles (iii) manual review of abstracts (iv) full text review. Key words used in the search were: Sustainability, Supply Chain, Supply Chain Management, SCM. sSCM, SSM, added with 'Asia' and 'China'.

Through the search, multiple databases were explored. Beyond academic journals other material was included in the research, such as white papers, theses, fact sheets, reports, newsletters, internet pages etc,. This material is referred to as 'Grey literature' (Rothstein & Hopewell, 2009).
Based on the abstracts the relevance of the articles for the thesis was judged and a subsequent selection was made for a full-text reading.

The literature review is used to explore the conceptual framework of Ageron cs. defined as a 'collection of two or more interrelated propositions which explain an event, provide understanding, or suggest testable hypotheses' (Meredith, 1993, P7). To explore the framework, a stage model for analysis was adopted from Dibbern, Goles, Hirschheim & Jayatilaka (2004). (Table 4.1)

Phase	Stages	Research Question/ Content	Theme
Motivation	1. Why	The importance of Sustainability and implementation difficulty.	Problem Identification
Scope	2. What	Sustainability in Supply Chain.	Syntheses
Method	3.Which	Selection from existing literature on Sustainability and SCM in China using key search terms.	Literature review
Theoretical foundation	4. How	Questionnaire around the model for Sustainable Supply Management (SSM).	Questionnaire
Evaluation	5. Outcome	Data collection and analysis.	Empirical analysis

Table 4.1: Framework of Analysis (based on Dibbern, Goles, Hirschheim & Jayatilaka 2004).

Research objective

Ageron, Gunasekaran & Spalanzani (2012) detected a low number of reported studies on the sustainable supply management in general. This is particularly true for China where, due to the scale of proceedings, current environmental conditions attract the attention of many, both domestically as on an international scale. An empirical study on the subject in the Peoples' Republic is therefore appropriate. The conceptual model of Ageron is therefore applied and tested on the local China situation. The premise of this research is to determine the critical success factors and enabling conditions for sustainable supply management in the Asian

country and compare these to the results reported by Ageron (2012) in France as well. Following Ageron cs., this is done with focus on the upstream supply chain and the objective to examine the topic of SSM from the perspective of the supplier selection process. Details of the research methodology used for the research and results are presented hereafter.

Research Methodology

A survey, building on the research by Ageron cs. (2012),was used to collect the data for the research. (Appendix A). The questionnaire contains three sections centered around business and personal demographics and sustainable supply management in the company of the respondent. Questions on the latter category were presented on a Likert scale. On a 7-point scale varying from 'Strongly disagree' (1) to 'Strongly agree' (7), respondents were invited to match to which degree they did concur to the statements in the questionnaire.

Of the supply sustainability questions in the survey, seven are related to sustainability in general and the views of respondents towards the topic on reasons for sustainable supply management.17 questions focus on vendor selection performance criteria. In relation to upstream supply chain 11 questions deal with greening of supply chains. Supplier characteristics of the respondents' organizations, such as scale and geographical location are captured in 12 questions. The managerial decision making process around partnering with suppliers is addressed in the following six. 17 topics relate to possible reasons for resistance to change and obstacles for moving towards a greener supply chain. Finally, the focus on the definition and acceptance of sustainability, challenges and benefits are addressed in 10 questions.

The questionnaire was completed in the English language and validated after translation into simplified Chinese. In two proofs the questionnaire was checked on interpretation and the accuracy of translations. Following a questionnaire review, the survey was slightly modified, confirmed and published.
Ultimately responses from 78 China based firms could successfully be used. The questionnaire was conducted in the months of September and October 2015.

Conceptual framework

Compelled by the ever continuing changes in the business environment, the call to develop conceptualizations in the field of supply chain is persistent. In an extensive, systematic literature review, Ashby, Leat, & Hudson-Smith (2012) conclude that in the new and evolving nature of SCM and sustainability, research is largely centered around quality data methods, theory development and the need for it to be further developed. Following this observation an appeal is made to develop a more holistic view on sustainability in supply chains.

Trailing this appeal, the call of Ageron cs. (2012) is followed to conduct a cross country empirical study. To explore potential differences on sSCM the theoretical framework of Ageron cs. is positioned on China.
The model is based on seven elements influencing Sustainable Supply Chain Management. In this section these 'building blocks' are reviewed on basis of the literature review (Figure 4.1, Table 4.2).

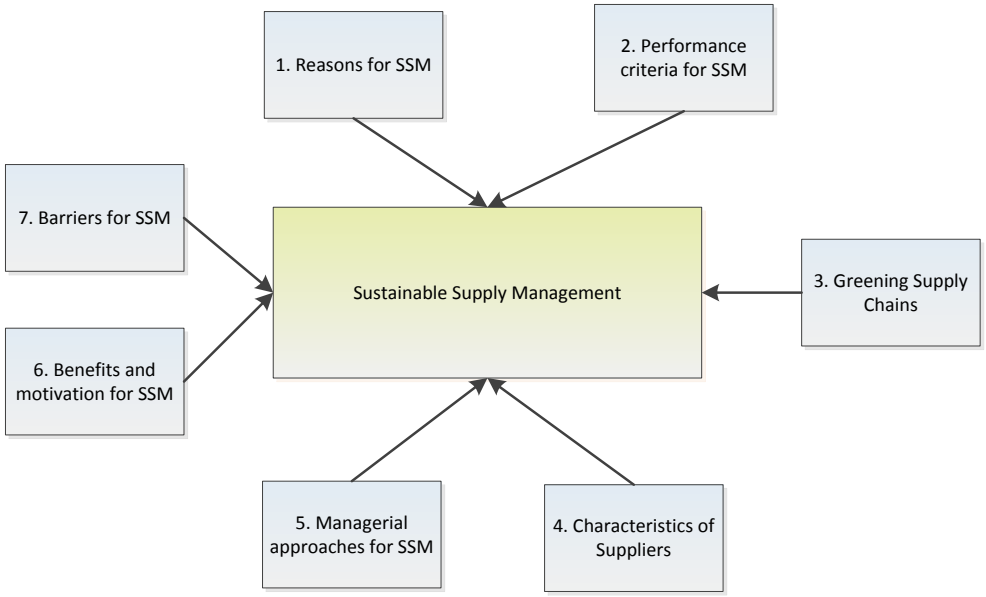

Figure 4.1 Model for sustainable supply management (source: Ageron, Gunasekaran & Spalanzani, 2012)

Construct	Definition
Reasons for SSM	The factors or causes explaining the existence of Sustainable Supply Chain Management.
Greening Supply Chains	Green Supply Chains focus on cooperation between business partners for the purpose of developing products that are environmentally sustainable (Zhu, Sarkis & Lai, 2008)
Performance criteria for SSM	Environmental performance relates to the ability of enterprises to reduce their ecological footprint.
Characteristics of Suppliers	Features that help to identify, tell apart, or describe recognizably; a distinguishing mark or trait of suppliers.
Managerial approaches for SSM	The way corporations begin to deal with Sustainable SCM pertaining to the management function and principal responsibilities.
Benefits and motivation for SSM	The perceived advantages and features that arouses an enterprise to action toward Sustainable SCM goals
Barriers for SSM	Immaterial causes which obstruct or impede SSM to start or evolve

Table 4.2 Construct definitions.

Reasons for SSM

The review on the literature on Sustainability and SCM strongly indicates there are intersections between Supply Chain and Sustainability. The combination of Supply Chain Management (SCM) and sustainability has culminated in 'sustainable SCM', or sSCM. Sustainable SCM portrays the strategic, transparent integration and achievement of an organization's social, environmental and economic goals in the systemic coordination of key inter-organizational business processes for improving the long term economic performance of the individual company and its supply chains. (Carter & Rogers, 2008). When coupled with economic objectives to develop a clear, long term strategy, the inclusion of SCM activities in a firm's sustainability can actually create a longer lasting and less imitable set of processes contributing to the financial bottom line (Carter & Rogers, 2008). As discussed earlier there is also an increasing focus of organizations, be it profit or non-profit, to develop corporate social responsibilities and take interest in saving natural resources. Apart from internal influences, this is particularly reinforced through external pressures such as competition, NGO's and regulatory requirements (Ageron, Gunasekaran & Spalanzani, 2012).

Performance criteria employed for sSCM

Collaborative process improvement plays a crucial role in the attainment of a sustainable competitive advantage. (Nakano, 2009). In assimilating business processes, paramount alignment factors beyond economic customer focus, quality, efficiency and responsiveness include environmental sustainability. (Green Jr, Zelbst, Meacham & Bhadauria, 2012).

As supply chain management nowadays has become a competitive advantage to corporation's management, the question on how to integrate corporate trade, logistics, capital as well as information has become a critical issue for achieving competitiveness and performance. (Song & Yu, 2008).

Furthermore, it should be noted that performance measurement in the present business environment is very versatile. With the emergence of a global manufacturing and sourcing network and the real time transparency of information through the internet, the business performance management process has been redefined, and is likely to continue to do so. New metrics are emerging, are more externally focused and adaptive for competing in the collaborative economy of suppliers, producers, distributors and customers. The challenge is how to optimize measures to improve sustainability pertaining business advantages. Designing performance measures for supply chains appears indeed to be challenging and an arduous task for organizations (Gopal & Thakkar, 2012 ; Chae 2009; Shepherd & Günter, 2011). HSE managers are often puzzled when it comes to actually implementing a strategy of sustainability and translate it into action. (Epstein & Roy, 2001).

There is a variety of events on environmental and social issues that a firm can undertake to improve, but also adversely risk to affect the bottom line (Carter & Rogers, 2008). Nonetheless, companies need to adapt their strategies to respond to the increasing demand on sustainability aspects (Zhu, Geng & Lai, 2010), With a change in strategy of the organization, there is likewise a necessity to introduce new metrics in an increasingly global business environment and further evolve the measurement system of the organization. (Wahlers & Cox,1994).

Changes in organizational forms, structures and processes occur due to changes in the environment. (Carter & Rogers, 2008) Also for this reason, companies are forced to focus more and more on exogenous factors and must adapt to compete in the collaborative economy of suppliers, producers, distributors and customers. (Basu 2001). Learning that occurs between these business partners concerning environmental and social factors to commit to developing sustainability goals, is a long term journey. Such learning can however pay off and positively influence business performance. Likewise, it can significantly reduce operating costs in supply relationships (Carter, 2005).

Just like any other initiative which unfolds in the organization, sustainability initiatives have nevertheless the possibility to fail. It is crucial to acknowledge this and to initiate steps to adapt to such mishaps. (Carter & Rogers, 2008). Facing this challenge, setting up a harmonized performance measurement system with key metrics needs to be well orchestrated and moreover stresses the need to frequently monitor and appropriately action any anomalies found.

Greening Supply Chains

Greening of the supply chain generally refers to the screening and selection by enterprises of their suppliers on environmental performance. Consequently business is conducted with those complying to regularly standards protecting the environment. This safeguards natural

resources and reduces global warming and carbon footprint (Rao, 2002 ; Ageron, Gunasekaran & Spalanzani, 2012). Yet, the driving forces for the concept are numerous, varying from reacting to external pressures to strategic and competitive advantage responses (Sarkis, 1999), and evolving concept goes deeper than merely a selection process. It also pertains to collaboration with focus on the decision making process amongst the interdependent parties. Collaboration implicates multiparty ownership of decisions and responsibility for results. (Stank, Keller & Daugherty 2001),

Within this setting, the enterprise is aimed to gain consensus between disparate functions and aligning the goals of the different supply chains through e.g. collaborative green product research and development, the aid of supply chain partners on taking sustainability initiatives and set up an environmentally forthcoming business, thus adding in the creation of a streamlined green supply chain.

According to Stank, Keller & Daugherty (2001) service performance is positively influenced through collaboration with external supply chain entities, which consequently results in improved internal collaboration. Through external collaboration, valuable information can be obtained, such as inventories, point of sale order patterns, planned promotions, etc. for performance enhancement. Collaborative Planning, Forecasting and Replenishment (CPFR) concepts are designed for exactly this purpose. Feeding back information into the organization, internal collaboration is just as much of importance, to reach the right employees and follow through. This facilitates close interactions, bringing superior expertise to operational execution levels with focus on activities and resources as required. (Stank, Keller & Daugherty 2001). Other benefits can be found in setting mutual benchmarks and avoid the exacerbation of sustainability issues triggered by reciprocal cost cuttings harming SSM investments due to price pressures passed on in the supply chain. Higher efficiencies can be achieved amongst partners through agreements on mutual standards, codes of conduct, assessment protocols and auditing standards. Where suppliers are able to follow one set of requirements, multiple contradictory rule sets can be avoided. Another advantage could be pursued through the creation of shared data sets and knowledge banks, used in decision making and to provide a more comprehensive understanding of issues. Companies joining forces also stand a better chance to influence and convince authorities in adapting to new legislation and enforcement in favor of sustainability. This is especially true for countries where sustainability issues are systemic.

In the comprehension of how to facilitate behavioral change in the organization, the external to internal collaboration relationship could be a crucial element. This implies that collaborating with customers and suppliers is a first step towards effective collaboration within the enterprise. (Stank, Keller & Daugherty 2001), The same implication could be true where it concerns the triple bottom sustainability subject.

On a final note, developing the required business metrics to support greening the supply chain involves a rather complicated process. The development of business metrics can be very challenging in ordinary businesses (Chae, 2009 ; Lapide 2000), let alone for collaborative business partners along all nodes of the chain.

Characteristics of Suppliers

Whether suppliers are motivated to embark and evolve their sustainability management may be influenced by their characteristics. Factors which could come into play are the scale of the enterprise size, the geographical location, the company culture which translates into the vision

and strategy of the enterprise as well as the scope of their operations (Ageron, Gunasekaran & Spalanzani, 2012)

The size of a company determines access to resources, capital, knowledge and skills to effectively drive the sustainability agenda. In this respect small and medium sized enterprises (SME's) may be disadvantaged when compared large scale companies or Multi National Enterprises (MNE**)**. Smaller size organizations could be slowed down, or even relinquish making efforts on SSM.

To achieve a corporate, social and environmental sustainability approach, the topic at least needs to be embedded in the value propositions of the company strategy. A proper execution of the strategy is imperative to achieve the objectives related to the sustainability value proposition. Leadership is required to establish the unity of purpose and direction on the sustainability agenda. Equally the strategy needs to cross company borders in order to foster an environment in which employees and business partners alike get fully exposed. This enables their abilities to be involved in the end-to-end supply chain process to the benefit of partnerships in which joint objectives on sustainability can be pursued successfully.
On top, a long term strategy allows for continuous performance improvements through permanent focus on the overall objectives of the organization. Furthermore a factual approach to decision making by follow up of the sustainability strategy ensures effective decisions are based on the data analysis and information to recognize and reward performance.
Through strategy the supply chain partners are allowed to migrate through various maturity levels; from basic understanding to full acceptance, leading from commitment to an 'automated' organizational behavior. Growing the awareness on the triple bottom line will move an organization to surpass compliance and bring added value to the company. On the long run, this engenders an instinctive sustainability behavior with a leading competitive advantage.

Price, quality and delivery are considered as top criteria in supplier selections. The importance of these factors have hardly changed over the past decades. To be able to become a strategic supplier, or even enter the supplier list in the first place, companies consider these as threshold requirements in the screening process. (Cheraghi, Dadashzadeh & Subramanian, 2011). Suppliers are expected to meet delivery deadlines in conformity to quality prerequisites. Minimizing manufacturing disruptions in operations could be a plausible explanation for the importance buyers lend to these elements.
Cost considerations have played their part in globalization. (Min, 1994) Many suppliers have moved their sourcing from domestic locations to developing and mid-income countries with lower wages, hence with a production cost advantage over developed nations. The exploitation of the relative strengths in diverse geographical locations around the globe has been made possible by improved logistics and information technologies, connecting supply chains. An ever increasing number of trade agreements continue to lower the trade barriers. At the same time this appears to be at odds with sustainability. Longer lead times introduce uncertainty in the supply chain and have their impact on carbon foot print due to transportation over long distances. The choice of strategic partnerships with suppliers is aimed at fostering long term relationships. Such relationships enhance the sustainability of Supply Chains and are therefore gaining in importance in a globalizing world.

Managerial approaches for sSCM
True sustainability occurs on the convergence of the environmental, social and economic areas of the triple bottom line (Carter & Rogers, 2008). To improve sustainability, the

strategic vision and setting of strategic objectives in a company needs to express all three elements explicitly and comprehensively in its long term approach. Further, it is required to identify enablers to translate these to the operational level to execute the strategy effectively. In most definitions on sustainability and supply chain a consideration of the long term performance is incorporated. sSCM is thus of strategic value and aiming to ensure all plans and accomplishments are aligned to support the actual execution of the strategy. Especially, the way to integrate corporate trade, logistics, capital as well as information has become a critical issue for achieving competitiveness and performance. These tactical plans are linked to the long term strategic and business plans. (Thomé, Scavarda, Fernandez & Scavarda, 2012; Ling and Goddard 1988; Wallace 2004; Song & Yu, 2008)

Olhager, Rudberg & Wikner (2001) view the enterprise connections and interactions in relation to the importance in the capacity management strategy needed to fulfill demand on the long term. Capacity issues are dealt with in affiliation with demand on the long term, hence the strategic level as part of the sourcing and manufacturing strategy. In a Manufacturing Planning and Control system the longest planning horizon in view belongs to the manufacturing strategy element of manufacturing infrastructure. This view is supported by the general approach on decision making concerning capacity increases or reductions. These tend to come in larger discrete steps and longer time intervals, rather than high frequent minor increments. (Olhager, Rudberg & Wikner, 2001). Though the field of research of this thesis is beyond the manufacturing landscape, these are often long term choices made in the context of business strategies and therefore should be made in conjunction with the sustainability theme. Hence companies need to adapt their strategies accordingly in response to the increasing pressures on sustainability from the business context. Equally, strategies emphasizing on the eco-environment could increase competitive edge and improve business performance. (Sharma, Iyer, Mehrotra & Krishnan, 2010). Commonly, enterprises follow generic strategies; least cost, differentiation and niche (Porter, 1980), This framework can be used to rope in sustainable elements (Shrivastava & Hart, 1995)

Conversely, the issue with strategy lies in the implementation. (Bossidy, Charan & Burck, 2011) This is particularly apparent where it concerns sustainability (Epstein & Roy 2001). Appropriately it requires tenacity in the strategy dialogue. The need to maintain a longer term, hence strategic view, is endorsed in the definition by Starik & Rands (1995, p909) in which entities, individually and collectively, exist and flourish for lengthy time frames through sustainability.

Barriers for sSCM

To identify the enabling factors for SSM, the obstacles prohibiting its development need to be recognized first. Barriers can have economic and financial backgrounds. Economic uncertainties are a hindrance to sustainability programs. In times where economies slow down, often trade barriers are erected to protect domestic interests. Development models and strategies are often dominated by a focus on financial growth. Corporate Social Responsibility and environment are at best secondary to these objectives, if taken into account at all. This is particularly the observation in developing and mid-income markets (Rao, 2002).
In internal capital allocation, decisions to improve environmental sustainability may be disregarded as companies often lack the internal mechanisms to properly value the benefits of managing CSR and environmental sustainability. Reducing exposure to energy price volatility and lowering impact on water resources can be influenced through operations and supply chain policies.

This requires a change of view to consider the economical side of business as part of the environmental viewpoints, rather than the other way around. For corporations this beholds a need to adjust financial objectives to maintain environmental intentions.
To be effective as an organization, the objective and priorities pursued in these policies must be clear and aligned between supply chain and financial decision makers. Divergent priorities result in missed opportunities to improve financial performance through environmental advancements in processes and product portfolios.

Politics form another barrier to sustainability. Deficient economic, social and environmental policies impede the implementation and development of sustainable purposes.
This leads to discrepancies in the triple bottom line. In the China 5-year plans since the 1980's, a pressure for rapid growth has lifted the masses from poverty, yet also brought about rapid environmental degradation and an ominous social imbalance. Chinese manufacturers face economic losses due to a lack of vision on the environmental issues in the country (Zhu &Sarkis, 2007). The 12th five year plan for China, proclaimed in 2011, is committed to transform the development model. The current low-efficiency, high-growth model contains objectives on not only economic growth, but also seeks structural reforms on social services development, carbon emissions and protection of the environment. In the broader context of China's 2020 goal of reducing carbon emissions up to 45%, the latest five year plan sets a target for reduction in carbon intensity by 17%, and looks for an increase in the share in consumption of renewable energy options. Such long term 'green' initiatives can overcome the difficulties of assessing economic gains. (Carter & Dresner, 2001)

Sustainability can also be obstructed socially, triggered through for example environmental issues, limited awareness on sustainable development, a low level of interaction between governments and the civil society, a lack of incentives for the private sector to pursue sustainable development. In China, there are large social challenges in sustainability development around population growth, combined with unsustainable consumption patterns amongst the wealthier levels of society. Neglect of an unequal distribution of wealth across communities easily distorts the equilibrium.

Benefits and motivation for SSM.
Drivers of corporate sustainability are business strategy, sustainable actions, sustainable performance, stakeholder reactions, corporate financial performance (Epstein & Roy, 2001). In the market driven competitive world, businesses are continuously seeking new strategies and business models to excel (Basu, 2001). In positioning these plans and policies it is crucial to understand the perceived benefits and motivations to be pursued.

Benefits stemming from SSM in the model of Ageron cs. (2012) are customer satisfaction, quality improvement, trust enhancement, costs control, risk fill rate, inventory optimization, flexibility increase and lead time decrease.
Motivators for sustainable performance may include workforce diversity, environmental impact, job creation, community involvement, ethical sourcing, human rights, product safety and product usefulness. In the context of the organization the discernment of stakeholders, such as employees, the community, customers, government authorities, investors, financial analysts are all to be apprehended to set objectives to pursue expected benefits.

5. Results

Respondents to the survey are from various disciplines. The majority is acting in the field of integrated supply chain, related to the sustainability research subject. This is in line with the objective of the survey.
There were no particular restrictions set on the type of industries or company activities. Yet, 73% is representing the manufacturing and process industry. A wide variety of activities is found on the remaining 27%; Medical 5.1%, Banking, Retail, Transportation providers and Research are all at the 3.8% mark, The last 6,4% is found, In Wholesale, Government and other industries.

Empirical analysis

Following the call of Ageron, Gunasekaran & Spalanzani (2012) to expand the scope of research on supply sustainability, this study is aimed at conducting an empirical analysis in the People's Republic of China. It provides a cross country exploration on possible similarities and differences in the conceptual framework developed by Ageron cs.which was tested on a sample population of companies in France. The identical model is reviewed and analyzed in this study against the current state of sustainability in China, where the subject is attracting considerable interest from home and abroad. The second largest country in the world in terms of Gross Domestic Product (GDP) is facing immense challenges on the triple bottom line.

The SSM model of Ageron consists of 7 constructs; Reasons for Sustainability in Supply Management, criteria employed for SSM, greening supply chains, characteristics of suppliers, techniques for SSM, barriers for SSM and benefits of SSM.

Reasons for SSM
Consistent with research by Ageron cs., a primary internal driving force behind Sustainable Supply Management adoption is resulting from top management involvement. Top management and CEO's attitude are main factors for inclusion of sustainability in the company's strategy (Ageron, Gunasekaran & Spalanzani, 2012; Zhu, Sarkis & Geng, 2005). Yet, enterprises that become sustainable need to do more than simply connect sustainability initiatives with corporate strategies. These organizations also have to change their company cultures and mindsets. Achieving this requires full top management involvement to propel the sustainability agenda in the enterprise. (Savitz, 2012).

Coherent with the results of Ageron cs., it is also apparent from the China survey that decision making on sustainability is largely influenced outside the enterprise boardroom. The external stakeholders (customers, suppliers and government) have a significant influence on the sustainability agenda of the company.

There is consensus amongst scholars that customers as well as the government authority in China are the most important elements for promoting sustainability developments. Government legislation has been found to be a main pressure. The Chinese government plays an extremely strong role compared to other countries in leading change, and with a far further reaching influence. Evidently these initiatives, ran by the centrally led state, do constitute a large influencing factor in enterprise boardrooms when drafting company strategy and policies. Furthermore development of sustainability is strongly influenced by organizational characteristics. (Sarkis & Zhu 2011).

Conversely, if players would proactively engage in sustainable practices the risk of the introduction of new and costly regulations could be reduced (Porter & Van der Linde,1996). Following this reasoning, the need for government involvement could be decreased with it over time.

Another important observation on the government regulatory programs as an impetus for SSM is that enforcement and acceptance needs to catch up with western countries. Where the corporate system in western countries is based on clear responsibilities, the Chinese view in business practice is characterized by ambiguous responsibility and non-thorough implementation. Moreover, the legal system in China does not protect businessmen and manufacturers (Hou & Li, 2014). Nevertheless since the incumbent prime minister of the China state council Li Keqiang (李克强) declared a "war on pollution" in 2014, regulators are starting to demonstrate this is taken serious. The first ever 'code red' issued in Beijing end of 2015 following a week of 500+ level in the air of PM2.5, shows the sentiment of China inhabitants is no longer to be ignored. PM2.5 signifies the smallest measured particle matter, which is most harmful to health. The world health organization (WHO) guideline on PM2.5 is 25 $\mu g/m^3$ (24-hour mean) (WHO, 2004).

The results of the China survey further outline that the influence of Non-Government Organizations (NGO) is of relatively lower importance in China than in France. NGO's generally influence companies in behaviors and decision making around the sustainability topic by increasing the public awareness and lobbying at government authorities. (Ageron, Gunasekaran & Spalanzani, 2012; Meixell & Luoma, 2015) This observation of lower NGO interest is coherent with the limited freedom of press, internet censorship and control over public discourse in the People's Republic. Additionally, Chinese NGO's have a short history and therefore lack the maturity level of their counterparts in western countries (Hou & Li, 2014). It was not until national reforms in 2011 that constraining administrative systems where abolished, leading to establishment of larger numbers of NGO's since 2012 (Wang, Alon & Kimble, 2015). Arguably, the censorship imposed by the China party authorities limits the pressure NGO's can display on the Chinese industry. This further decreases the public pressure on companies, specifically those which are state owned.

Table 5.1 Reasons for SSM

Reasons for SSM	Mean	Standard deviation
Top Management vision	6.14	0.849
Nature of the business	5.88	0.853
Customers' expectations	5.83	0.918
Suppliers' green initiatives	5.77	0.867
Government regulatory requirements	5.63	1.033
Competitors' actions	5.55	1.052
Other Stakeholders (Such as Non-Governmental Org's)	5.35	1.067

Note: Likert Scale : 1= No agreement 7= complete agreement

Performance criteria employed for sSCM

Equal to the study of Ageron cs., price (6.29), reliability (6.24) and quality (6.23) are perceived as most important criteria concerning supplier selection (table 5.2).

The importance of long term relationships in Chinese business structures does emerge from the survey results. A close business relationship called G*uanxi,* is considered to be an imperative constituent to run a successful company in China. *Guanxi* provides an improved level of accessibility to information, resources, credit as well as protection from external

competition (Lee, Pae & Wong, 2001). Long term relationships show high correlations with the collective (0,65) and collaborative (0.70) management approaches. This expounds the level of importance in the selection criteria used in the upstream supply chain in China where parties are committed to sharing social norms of reciprocity and obligations.

The sustainability criteria appear to fall behind the more traditional elements for supplier selection, despite the increasing awareness of the public and government measures to curb the detrimental effects of the fast growing economy on the eco-environment.

Compared to the research by Ageron cs., social responsibility appears to be a more important topic in the selection criteria. From the survey responses, there is a significant correlation of CSR with "Eco-design' and 'Carbon footprint'. This is an important observation, since the position towards corporate social responsibility (CSR) in China is different from other nations. With the short history of developments on Non-Governmental Organizations (NGO's), CSR practice is still in its infancy in the Peoples Republic. Up to now CSR is only driven through legislation and law enforcement by the government (Hou &Li, 2014; Wang, Cui, & Liang, 2015). The topic is also found to be fragmented amongst various laws such as labor laws, consumer protection laws, environmental laws, women's rights protection laws, and corporate laws. (Sarkis, Ni & Zhu, 2011) Most CSR definitions outline that CSR practices go beyond legislative directives. Yet, Chinese enterprises generally motivate social responsibility as supplemental to grow their revenues (Hou & Li, 2014). This profit oriented conduct towards CSR could limit the scale of social responsible activity and accomplishments. Nevertheless there are indications CSR is perceived to become of higher importance in the overall sustainability thinking (Sarkis & Zhu, 2011).

Table 5.2 Importance of performance criteria in the upstream supply chain

Supplier Selection Criteria	Mean	Standard deviation
Quality	6.29	0.899
Reliability	6.24	0.856
Price	6.23	0.867
Service rate	5.94	0.902
Information technology and System	5.94	0.944
Flexibility	5.86	0.817
Certification	5.86	0.936
Long term relationships	5.82	0.908
Delivery	5.79	0.812
Size	5.76	0.928
Environmental issues	5.76	0.942
Social Responsibility	5.74	0.904
Associated services	5.71	0.839
Confidence	5.62	1.022
Economic dependency	5.56	0.934
Geography proximity	5.54	0.963
Personal relationships	5.51	0.990

Note: Scale : 1= Least important 7=Most important

Greening Supply Chains

As a major manufacturing country, China has many opportunities on greening supply chains. However this opportunity comes with substantial environmental burdens (Rao, 2002). As China increased its industrialization, a lack of infrastructure and availability of tools to take care of end-of-life products do place an environmental liability on the country. Potentially,

Greening Supply Chain Management (GSCM) concepts reduce such environmental barriers (Zhu, Sarkis & Geng, 2006).

Traditionally, external GSCM practices such as suppliers ISO14001 certification, are positioned in the realm of Supply Chain Management (Zhu, Sarkis & Geng, 2006). China has witnessed an impressive upsurge in the number of ISO 14001 certifications in the last decade. By the end of 2008 it even ranked first in the list of top ten countries. The promotion of ISO14001 by the Chinese government and local enterprises alike is supported by the results (table 5.3) and reinforced by the high correlation with top management vision on sustainability (0.66).
Although ISO14001 is a "process standard aimed at ensuring that facilities have a workable environmental management system (EMS) in place", it does not dictate that actual improvements are made in a facility's environmental performance (Sarkis, Ni & Zhu 2011). The latter is a disturbing reality. As awareness increased following state driven regulations and competition, there is a still a distinct lack of Green Supply Chain Management adaption in practice (Zhu, Sarkis & Geng, 2005).

Other prominent topics stemming from the questionnaire are 'production resources systems' (5.86) and 'lean management' (5.85). The above is in line with the observation that sustainability thinking in China is developing from a focus on environmental technologies towards ISO14001 and cleaner production process thinking (Sarkis & Zhu 2011). It would also explain the low ranking of 'waste reduction' compared to Ageron cs. (2012).
With the increase of public concern on pollution, particularly since the prominent smog and haze blanketing many Chinese cities in early 2013, the Chinese government has started to enforce measures and contributed to the revision of the environmental protection law in 2014 (Feng & Liao, 2016). Being amongst the world's biggest consumers of natural resources, China faces a relative scarcity of supplies and is confronted with ecological barriers, giving further reason to address sustainability. This augmented the interest for corporate and industrial environmental management measures to counter pollution levels. Chinese enterprises have become more aware on environmental matters following regulatory and competitive drivers as well as marketing pressures.

The high attention level for carbon footprint resulting from the survey might be associated to increased reasons for enterprises to deal with pollution issues. The central government progressively interferes with the economy by directing to cease manufacturing and limit transportation, be it pro-active or re-active. Authorities particularly step in during national showcase events and the occurrence of longer lasting hazardous pollution levels. Examples of air quality protection efforts made during major events are the Beijing Olympics in 2008, The 2010 Shanghai Expo, The 2014 Nanjing Youth Olympic Games and the recent 70th anniversary of ending world-war II in Beijing. More and more cities start to limit the number of car license plates issued to downsize the pollution problems. Consequently it is in the interest of industries to actively aid in curbing the cumulating effects and contribute on lowering air polluting discharges. An increased environmental performance would arguably lead to a decreased interference by authorities with industrial production. This removes the economic performance barriers for corporations, as it would also benefit social performance serving the public cause.

Consistent with the findings by Ageron cs. (2012), the downstream supply chain topics 'reverse logistics' is ranking at the bottom of the table.

Table 5.3 Greening Supply Chains

Greening Supply Chains	Mean	Standard deviation
Product life cycle management	5.88	0.897
Production resources system	5.86	0.990
Certification ISO14001	5.85	0.927
Lean Management	5.85	0.884
Green transportation channels	5.83	0.932
Reducing carbon footprint	5.73	1.002
Clean programs	5.72	0.979
Savings from packaging	5.69	0.930
Eco-design	5.67	1.015
Waste reduction	5.58	1.038
Reverse logistics	5.53	0.963

Note: Likert Scale : 1= No agreement 7= complete agreement

Characteristics of suppliers

As may be expected, national companies predominantly partner with domestic suppliers on sustainability matters. In comparison, international companies are larger scale industries and select collaboration more along their geographical supply lines. Next to native suppliers, Western European and North American suppliers are the predominant international sustainability partners. African suppliers hardly appear to be of interest when it comes to sustainability developments (Table 5.4). Evidently, sustainability appears to be a more obvious topic in large internationally operating companies. Being at a higher risk than domestic companies, there is an intrinsic drive for compliance to China legislation by international companies (Lin, Moon & Yin, 2014). Apart from the threat of high fines and possible imprisonment, the fear of tarnishing their image likely gives reason for caution.

In general, the smaller the company size, the less interest seems to be given to sustainability matters. With low correlation levels, Small and Medium Enterprises (SME) appear to be hardly involved in the subject, similar to the findings of Ageron cs. (2012). As Ageron cs. further suggests, the absence of SME partnerships could be explained by a lack of financial means. This matches the findings of most scholars that in China the implementation of corporate sustainability is closely related to the company size. Larger companies are more motived to adopt sustainability developments than SME's based on superior access to resources. Due to their size bigger enterprises are also faced with larger environmental issues. Additionally, larger corporations are prone to greater public scrutiny, setting expectations on their behavior towards SSM (Sarkis, Ni & Zhu, 2011).

China is fully focused in its 5 year plans on doubling the economy per capita in the decade leading up to 2020 aiming to build a 'moderately prosperous society'. Whilst in the 13th five year plan the coal fired energy plants are part of the pledge to cap the overall carbon emissions, this growth target could proof to be detrimental to sustainability investments. After all, there is a potential conflict with the macro economy targets which poses the risk of deferring investments on the environment. This is especially true for SME's. Where large industrial players generally possess greater financial resources, SME's may be deterred from financial endeavors in sustainability.

Ageron Gunasekaran & Spalanzani (2012) highlight that long term relationships are deemed to be essential in SSM. The existence of *Guanxi* in China proposes therefore a positive element for future SSM developments and provides a natural advantage in exploiting sustainability partnerships and equally for the positioning of sustainability therein. Long term

relationships highly correlate with strategic suppliers (0.51) and East China Suppliers (0.57), the latter suggesting *Guanxi* importance. The value creation and performance uplift could conceive a commitment of supplying partners to sustainability requirements.

Table 5.4 Suppliers' characteristics in SSM

Supplier Selection Criteria	Mean	Standard deviation
Large scale companies (Multi National Enterprises)	5.87	0.958
Strategic suppliers	5.73	0.907
East China suppliers	5.71	0.927
Geographically near suppliers	5.65	0.951
Small and medium sized enterprises	5.62	0.943
Central and West China suppliers	5.36	1.248
European suppliers	5.31	1.342
North America suppliers	5.22	1.364
Other Asia Pacific suppliers	5.13	1.177
Non-strategic suppliers	5.06	0.998
South America suppliers	4.88	1.432
African suppliers	4.74	1.454

Note: Likert Scale : 1= No agreement 7= complete agreement

Managerial approaches

Integration is a key element for successful supply chain management. Such integration is a fundamental element to achieve success in sustainability. The lower score on the 'individual' managerial approach is similar to the results of Ageron cs. The low ranking of 'Reactive' approach is different from the findings in France, yet an encouraging one in the China survey outcome. Again the high collaborative ranking may indicate a relationship to *Guanxi*

An organization needs to be moved beyond informational and procedural qualities to achieve true integration (Oliva & Watson, 2011). Driving the organization along the lines of CPFR, and include sustainability in the collaboration amongst business partners, provides a strong external integration. Arguably, the strengthening of these ties do enhance the positive effects on triple bottom line initiatives in supply chains. Embedding the topics of CPFR and sustainability into the enterprise strategy benefits the triple bottom line achievements, provided it is well executed. The alignment and execution of strategies between partners in the chain is nevertheless challenging.

Research indicates a lack of involvement of suppliers when drafting the strategy and suggests that success is dependent on enabling a Supply Chain segmentation, i.e. making choices on partners to collaborate with (Barratt, 2004). As previously highlighted, an active top level management involvement, alert and keeping up with sustainability developments, is a prerequisite for success. Companies reactive to governmental regulation to obtain compliance can for instance result in increased cost for business (Carter & Rogers, 2008)

Table 5.5 Managerial approaches for SSM

Managerial approaches for SSM	Mean	Standard deviation
Collaborate	6.12	0.897
Pro-active	6.10	0.906
Active	6.01	0.919
Collective	5.83	0.874
Individual	4.85	1.469
Reactive	4.15	1.766

Note: Likert Scale : 1= No agreement 7= complete agreement

Barriers for sSCM

In the triple bottom line, environmental and social initiatives can be costly undertakings (Carter & Rogers, 2008). Collaboration, generally deemed to be a prominent element in obtaining SSM success, by itself is resource intensive (Barratt, 2004). The results of the survey reveal that return on investment is the principal obstacle for SSM in China. This supports the assertion of Ageron following other academic studies, that financial concerns are the predominant barrier for SSM. Especially for Small and Medium Enterprises (SME's) the need for investments would be expected to constitute a major barrier. However, from the survey response no clear conclusion can be made on this business size assumption and does require further research.

The period for a return on investment (ROI) needed to make an investment worthwhile is perceived to be short in China. The common payback period–a short- two years (Chandler, Gwin & Chen, 2011), which explains the ROI being a prime barrier. Innovation in Small Enterprises in China mainly relies on technology imitation, which involves small investment and fast pay back periods. (Zhao, 2010)

The subject of investments for SME and MNC alike is eminent in the SSM context. It can be argued that the preference for short ROI cycles has further heightened during global financial crisis. Hence a clear understanding of the economic value added from SSM investments to create opportunities and provide competitive edge is imperative.

Next to financial barriers, the institutional barriers indicate that the supplier firms' top management commitment, culture and size do not constitute prime barriers. An important obstacle emerging from the survey is the 'previous experience of the own firm on sustainability'. A possible explanation might be the incentive expectation most Chinese companies seem to have as a result of the tangible financial and ROI barriers.

Table 5.6 Barriers to SSM

Barriers to SSM	Mean	Standard deviation
Return on investment	5.91	0.840
Focal firm previous experiences on sustainability	5.71	1.152
Financial costs	5.65	0.895
Green investments	5.65	1.067
Focal firm top management commitment	5.65	1.160
Supply Chain configuration	5.65	1.004
Focal company human skills	5.63	0.941
Suppliers' human skills	5.60	0.931
Characteristics of the product	5.59	1.037
Suppliers' location	5.59	1.062
Focal company facilities	5.53	1.090
Product price	5.50	0.964
Suppliers' facilities	5.50	1.078
Green induced changes	5.47	1.113
Suppliers' firm size	5.47	0.963
Suppliers' firm culture	5.41	1.050
Suppliers' top management commitment	5.41	1.025

Note: Likert Scale : 1= No agreement 7= complete agreement

In the context related SSM elements focusing on suppliers (facilities, skills, commitment,, culture, configuration, size, location), the vendor skills ranks as the main barrier. The discrepancy in available resources and skills between customers and vendors was found to

hinder collaboration on sustainability more than their actual size, confirming previous research (Bowen, 2000).

Benefits and motivation for SSM

Government regulatory requirements are significant motivators. Scholars argue that the other main factor 'pushing' Chinese corporations into sustainability compliance are the internal stakeholders of corporations. Companies are 'pulled' by external stakeholders to be environmentally friendly (Sarkis & Zhu, 2011). The main benefits identified from the survey are predominantly external, with customer satisfaction leading the expected benefits from SSM. This is analogous to the result from the study by Ageron cs. on French companies, where a focus on image improvements is identified. Likewise there are benefits expected on the inbound supply chain from the side of suppliers in terms of fill rate and trust. Another observation is that in China the expected cost benefits have a significant correlation (0.51) with strategic suppliers.

Table 5.7 Benefits and motivation expected from SSM

Benefits and motivation expected from SSM	Mean	Standard deviation
74.Customer satisfaction	6.08	0.908
72.Quality	6.00	0.940
75.Trust in suppliers	5.90	0.920
73.Fill rate	5.85	0.898
78.Supplier lead time	5.83	0.959
71.Flexibility	5.73	0.750
77.Supplier's capabilities to innovate	5.72	0.910
79.Upstream supply chain risk management	5.63	1.046
76.Order fulfilment costs	5.62	0.983
80.Reduction of inventory	5.46	1.053

Note: Likert Scale : 1= No agreement 7= complete agreement

Model validation

Reliability

Cronbach's Alpha was used to test the measure of internal consistency on individual questions within each construct. (Table 5.8) A reliability coefficient of .70 or higher is considered to be acceptable. The alpha coefficient for six of the constructs is suggesting that the items have relatively high internal consistency. The construct 'Approach' however is rejected on basis of the low reliability result. It proofed impossible to bring the results to the minimum reliability score by elimination of one or more questions.

Construct Description	Construct Parameter	Cronbach's Alpha
Reasons for Sustainability	REASON	0.822
Suppliers' Performance Criteria	CRITERIA	0.924
Greening supply chains	GREEN	0.916
Supplier Characteristics	SUPCHAR	0.911
Focal company approach towards SSM	APPROACH	0.480
Barriers for SSM	BARRIER	0.947
Benefits of SSM	BENEFITS	0.903

Table 5.8 Reliability test on constructs

Model

In addition to Ageron's research a validation of the model was performed. The individual questions where translated into constructs by totaling the scores on the individual questions.

A multiple linear regression for Sustainable Supply Management on the constructs of 'Reason', 'Criteria', 'Green' 'Supchar', 'Barrier' and 'Benefits'. Following the undesirable results of Cronbach's test the 'Approach' variable is rejected from the model.
The dependent variable (DV) Sustainable Supply Management was constructed using two times the value of enterprise 'Pro-Active' engagement towards SSM, increased by one time the value of an 'Active' engagement. Stemming from this variables in the model used are:

Y = Enterprise engagement in Sustainable Supply Management (DV)
X_1 = Reasons for SSM
X_2 = Performance criteria for supplier selection
X_3 = Greening of Supply Chains
X_4 = Supplier Characteristics
X_5 = Barriers for SSM
X_6 = Benefits of SSM

Assumptions
The estimates are calculated using the least square method. The regression coefficients are set at a level of 5%.
For multicollinearity the maximum value is set to 0.8 to determine if variables failing this criteria should be eliminated from the model in order to determine the variables which *do* explain Sustainable Supply Management. Very small values in the tolerance also indicate a possibility of multicollinearity. The tolerance level minimum was set at 0.1.and the VIF – Variance Influence Factor- maximum level is set to 10.

Correlations

		SSM	REASON	CRITERIA	GREEN	SUPCHAR	BARRIER	BENEFIT
Pearson relation	SSM	1.000	.576	.794	.715	.436	.538	.726
	REASON	.576	1.000	.743	.778	.700	.605	.620
	CRITERIA	.794	.743	1.000	.899	.624	.667	.813
	GREEN	.715	.778	.899	1.000	.746	.670	.824
	SUPCHAR	.436	.700	.624	.746	1.000	.566	.622
	BARRIER	.538	.605	.667	.670	.566	1.000	.704
	BENEFIT	.726	.620	.813	.824	.622	.704	1.000

Table 5.9 Model construct correlations

All the correlations of SSM with the dependent variables above 0.3 are assumed to be significant. Since all correlation values are below 0.8 it can be concluded that no multicollinearity exists (table 5.9)

In Figure 5.1 the normal probability plot is displayed. The dots in the P-Plot lie close to the line, which shows a good fit, i.e. no deviations from normality. The scatter plot next to the P-Plot in the same figure, with distributions shaping a triangular, suggest there is only a small set of outliers violating the assumption that values should not be larger than +3 or – 3 time the standard deviation.
The Mahalanobis distance is used to check the residual statistics to test if outliers should be removed. Only 3 cases exceed the critical level of 22.46 for 6 predictor values. It is decided to not remove these instances, as these do not impact overall conclusions.

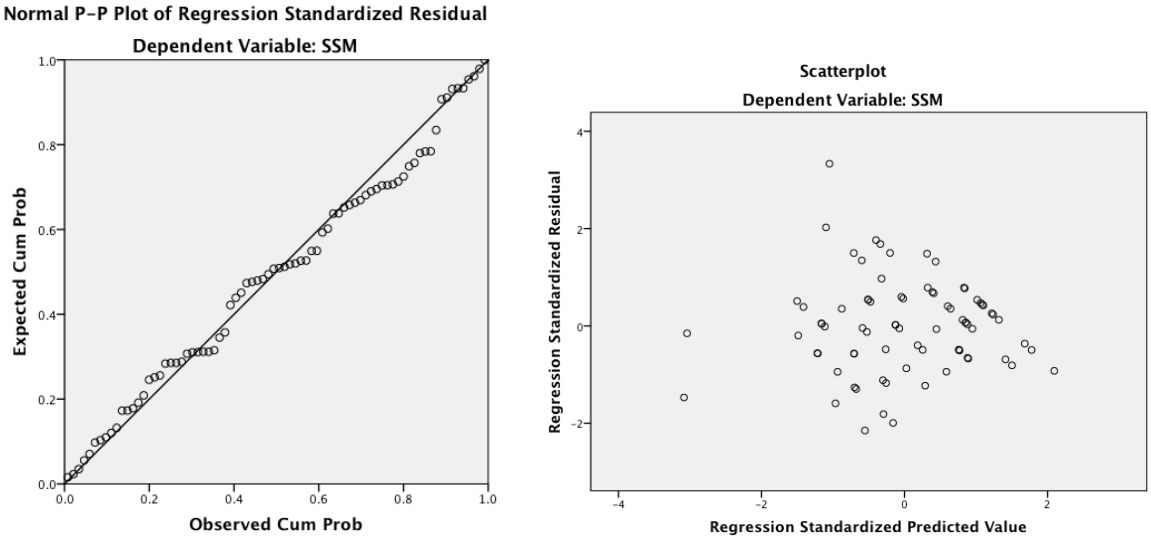

Figure 5.1 P-Plot and scatterplot for dependant variable SSM

Multiple linear regression

In Appendix 3, the SPSS outputs results stemming from the multiple regressions can be found.

The model $Y= \alpha +\beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5+ \beta_6X_6$ is reviewed to see which dependent variables would influence Sustainable Supply Management.
This regression results in a R^2 value of 81.6%, indicating an excellent 'fit' of the model. Adjusted for a low sample value, the 'fit' would still be good at 63.7%. R^2 is also significant with an F-value < 0.05. Yet the P-value for variables 'reason', 'green', 'supchar' and 'barriers' are > 0.05 and therefore not significant. These variables are eliminated with a stepwise regression results in the model. P-values for the variables 'criteria' and 'benefit' are below the 0.05 threshold and therefore significant.
As a result the model of Ageron using data collected in China only explains an influence on SSM from the constructs with 'Criteria used for the selection of Suppliers' and 'Benefits of Sustainable Supply Management'.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.037	1.610		-.023	.982	-3.243	3.170
	CRITERIA	.184	.016	.794	11.401	.000	.152	.216
2	(Constant)	-.424	1.589		-.267	.790	-3.590	2.742
	CRITERIA	.139	.027	.601	5.126	.000	.085	.193
	BENEFIT	.084	.041	.238	2.032	.046	.002	.166

Table5.10 SPSS results of the stepwise Multiple Linear Regression.

6. Conclusions

In recent years the People's Republic of China surpassed Japan in terms of GDP to become the second largest economy world-wide. Industrialization of the country has been stimulated aggressively in the 5 year plans, which has brought China the reputation of being 'the factory of the world'. The densely populated country is rapidly emerging as one of the world's biggest consumers of natural resources. The China party program is more and more aimed at securing its share of globally available resources.

These circumstances are in sharp contrast with other nations on the planet, but at the start of 2016 China has arrived at a pivotal moment in history to safeguard sustainable growth. In 2015, the growth curve of the Chinese economy started coming down. Stock markets at the beginning of 2016 are under fierce pressure. Moreover, beyond the challenged state of the economy, China needs to take care of the triple bottom line. Environmental and social responsibility need to be prominent topics on the domestic agenda.

The size of the country matches the immense problems it needs to address on the triple bottom line. Whilst emerging at the top of the world economy, the country's growth has taken its toll on the environment over the past decades. Rising pollution levels appear to have reached a new level of discontent and awareness within China, as well as outside its borders. This has served as an impetus for the authorities to increase legislation dealing with sustainability of the environment and to take care of social responsibilities.Whilst the intentions to direct sustainability through legislation are valuable, the legal system is far from perfect (Hou & Li, 2014; Feng & Liao, 2016). Although the air pollution is endemic, legislation to regulate the exhaust of PM2.5 size particles into the air is for example still absent (Feng & Liao, 2016). Whilst the environment is addressed through various environmental technologies and economic instruments, funding to stimulate education on industrial ecology is insufficient. Moreover, there is a deficiency on incentives to stimulate eco-industrial concepts. (Fang, Cote & Qin, 2007). The push for environmental improvements through legislation is severely troubled by such imperfections.

Summary of findings

Reasons for SSM

There are many drivers for sustainability. Whenever companies choose to progress on sustainability matters, the primary internal motive for SSM appears to be top management's vision. Scholars commonly recognize this as a critical element for an enterprise to adopt sustainability practices. (Ageron, Gunasekaran & Spalanzani 2012; Bai, Sarkis & Dou, 2015). This is closely trailed by the 'Nature of the business'. Both have significant influence on criteria for selecting suppliers, and greening the supply chain.

Similar to the research of Ageron cs. (2012) in France, major reasons to embrace sustainability for enterprises are found in the business context. Especially 'customer expectation' is a reason to practice SSM. Legislation by Chinese authorities and the ever-increasing enforcement also do strongly influence companies operating in the People's Republic. Interestingly, the WTO membership, obtained by China in 2013, particularly served as an external stimulus to develop corporate sustainability (Bai, Sarkis & Dou 2015). With the resulting exposure to foreign competitors, sustainability rapidly surfaced as a competitive element. These circumstances deliver companies the opportunity to tailor legislation into their business strategy to grow market share and develop new business. Reciprocally, China's

authorities can exploit this mechanism by harnessing sustainability in policy making, legislation and increase its subsequent enforcement.

Performance criteria for SSM
Identical to the results in France, Chinese enterprises identify Quality, Price and Reliability as the most constituent performance criteria in the upstream supply chain. There are strong correlations with Supply Chain greening elements.

The performance objectives of Service rate, IT and systems, Flexibility, and Certification, equally receive top ratings on the scale of importance when selecting suppliers from the sustainability perspective. Least important criteria are economic dependency, Geography proximity and lastly personal relationships.

Social Responsibility ranks higher compared to the study of Ageron cs. in France. In the Sixth Plenary Session of the Chinese Communist Party Social Responsibility conducted in 2006, the assembly proposed to advance Corporate Social Responsibility for the betterment of society. The survey response indicates strong associations with the greening elements of 'Packaging savings', 'Eco-design' and 'Reducing carbon footprint'.

Yet, with this encouraging observation, there remains a fundamental paradox between the generally celebrated achievement of low product prices by Chinese manufacturers and the lack of assuming social responsibility in their production processes. (Lin, 2010). This substantiates that more is to be done to stimulate companies to take up ethical business practices. The lack of CSR regulations in the nation (Bai, Sarkis & Dou, 2015) therefore needs increased government attention. More importantly, it will need to deal with the purported 'window dressing' in the public discourse on CSR (Lin, 2010).

Greening Supply chains
Greening Supply Chains (GSCM) is a major strategic operation across value chains in which SSM needs to be embedded (Ageron, Gunasekaran & Spalanzani, 2011). China nevertheless is only in the initial stage of Green Supply Chain management despite an increased awareness on environmental issues (Zhu, Sarkis & Geng, 2005). Conceivably this disadvantage is due to a lack of tools, knowledge and skills (Zhu, Sarkis & Geng, 2005). Still, another prominent barrier to be lifted is the fixation by Chinese enterprises on financial benefits from SSM, e.g. the leading topic stemming from the survey, 'Product life cycle management' is strongly related to the supplier selection criterion of 'Price'.

The literature research indicates there is influence by authorities on Chinese enterprises to embark on SSM. Environmental legislation is expanded and tightened. The prevalent promotion of ISO14001 certifications is one example of attempts by the government to stimulate supply chain greening. Yet it does not pay off to the desired extent as GSCM is still in its infancy in China. Organizations in China have recognized GSCM importance, but are lagging to bring its values into practice (Zhu, Sarkis & Geng, 2005). Correspondingly, the survey results indicate a fragile relationship between Government regulatory requirements and supply chain greening elements.

Characteristics of suppliers
In the process of selecting suppliers, a plethora of criteria can be applied. Large scale companies and Strategic suppliers, which are dominant in the business strategy, are preferred for SSM partnerships. Strong relationships are found with 'Supplier selection' criteria and

'Green Supply Chain' elements. Other main selection criteria for SSM partnerships are geographically near suppliers and suppliers based in the east part of the country. This preference is not surprising, given that most manufacturing activity in China is based on the east coast. Here, ensuing pollution levels are the highest throughout the Republic.

From the focal firm perspective, multinational enterprises are preferred over SME's. This is possibly based on the financial limitations SME's face when it comes to making investments in general and sustainability in particular. Non-China vendors and non-strategic suppliers are deemed to be of lower importance. In sustainability considerations, African suppliers appear hardly to be of any interest for China based enterprises.

Managerial approaches for SSM
Collaborate, Pro-active and Active approaches are the principal managerial approaches, with a strong link to top management vision on sustainability.

Yet, companies may hesitate to proactively advance on SSM due to the complexities surrounding its implementation (Epstein & Roy, 2005). Other propelling reasons are likely to be found in the barriers for SSM, first and foremost expected return on investment and financial cost.

The lowest ranking approach to SSM is reactive, i.e. there is preference to be non-complacent on sustainability matters.

Barriers to SSM
In relation to barriers, the importance of developing a strategy is emphasized to mitigate or even remove the obstacles to SSM (Ageron, Gunasekaran & Spalanzani, 2012). The primary strategy objective is the achievement of sustainable profitability. (Porter & Van der Linde, 1996). Financial costs, the return of investment and green investments emerge as the most prominent barriers for SSM. Top management involvement is both a relatively high influential factor for SSM (table 5.1) and a higher level obstruction to SSM within Chinese companies (table 5.6). Hence, this paradox constitutes a predicament.

A rational take on this dilemma is to start with a vison outline on sustainability by focal firm top management. A long term vision consisting of a primary focus on non-financial barriers could be turned around into a competitive advantage to make financial profits. Consequently these profits can be used for future sustainability investments. The further a company is able to advance in tackling the more difficult barriers, the more likely it is to be better positioned to keep ahead of its competition. Obviously this comes with many challenges, as actual strategy deployment and sustainability execution are commonly complex matters for companies (Bossidy, Charan & Burck, 2011; Epstein & Roy, 2001).

Examples of areas to pursue are green product and green process innovation, as research indicates these have a positive effect on competitive advantage (Chen, Lai, Wen, 2006). A challenge in setting strategic environmental policies will nevertheless be to balance product quality with environmental benefits. (Dangelico & Pujari, 2010). In the upstream supply chain, barriers can be addressed through supplier integration and collaborative development of programs to enhance sustainability skills and facilities. Finally, one of the biggest hurdles to overcome is perhaps the general perception of Chinese companies that sustainability primarily needs to bring profit with a short term return on investment.

Benefits and motivations of SSM

Customer satisfaction, Quality and Trust in suppliers are perceived as the prime benefits to be taken into account when developing SSM in China. Surprisingly most of the benefits are strongly correlated to the supplier selection criteria of IT and systems. This indicates high expectations on benefits from automated processes.

Conclusions and further research

Following the research of Ageron, Gunasekaran & Spalanzani (2012) on sustainable Supply Management in France, a study on SSM was conducted to review and empirically test the identical model in China.

The model contains seven components which influence SSM: (1) Reasons for sustainable SSM, (2) Criteria employed for SSM, (3) Greening supply chains, (4) Characteristics' of suppliers, (5) Managerial approaches for SSM, (6) Barriers for SSM, and (7) Benefits and motivation for SSM. A cross country empirical study was conducted to list the state of SSM in China to compare the results to the outcome of Ageron cs. SSM study in France. The responses are reviewed per construct and, in addition to the empirical research by Ageron cs., a linear reggression was performed to test the integral model using the survey responses in China.

In the summary the findings of the empirical research in China are:

- Based on the survey response in China, the statistical testing of the model of Ageron cs. reveals that only the constructs of 'suppliers selection criteria' and 'benefits' have a significantly relation to Sustainable Supply Management.

- Top management is a key internal driver for SSM in Chinese enterprises.

- There are strong pressures from external stakeholders in China to address SSM. In the business context, Customers, Suppliers and Government are influential SSM motivators. The role of NGO's is of secondary importance.

- In selection of upstream supply chain partners, Quality, Reliability and Price are the main influencing factors with significant correlation to greening elements.

- Scholars suggest CSR in China is underdeveloped, yet the survey results indicate it is attracting attention in Chinese corporations. There is significant correlation of Corporate Social Responsibility with "Eco-design' and 'Carbon footprint'.

- IT and Systems have an interesting significant correlation with greening elements.

- Supplier characteristics in SSM indicate a strong relationship with the greening of supply chains.

- Partnerships with MNC's are preferred over SME's and geographically close suppliers are preferred to overseas suppliers to advance on Sustainable Supply Management.

- The preferred approach of China based enterprises towards SSM is collaborative and (pro) active.

- Financial barriers are more prohibitive influencers than non-financial barriers. Expected return of investment (ROI) in China is short, which burdens development further.

- Expected prime benefits from SSM in China are customer satisfaction, quality and trust.

Further research
The results of this empirical study can be used for further research on SSM in China. Suggested areas to explore are:

- The proposed model of Ageron, Gunasekaran & Spalanzani (2012) could not be fully empirically validated from the survey results and does require further research in China.

- There are loopholes in legislation and ambiguities exist concerning Chinese legislation in general and sustainability in particular. Moreover, enforcement of legislation on sustainability is lagging. The underlying reasons and impact of these imperfections in China on SSM is a topic to be further explored.

- Personalized business relationships in China, labeled as *guanxi*, are considered to be a key element for running an enterprise successfully in China. Conducting an empirical study on *Guanxi* in the context of supplier sustainability management will be worth future efforts.

- Conduct an empirical study in various Chinese regions to explore if the model would present differences per region.

- Further study on the financial drivers for supplier sustainability in China would provide more insight in the perception of added value of sustainability in relation to investments and its returns (ROI).

Limitations

It should be taken into account that the findings of the study are subject to a number of limitations.
First, there is a substantial amount of Chinese language literature on the subject of sustainability. Analysis of these could be beneficial in research of Sustainability Supply Management. The dissemination of this information is narrowed by (internet) censorship in China and accessibility is far more difficult than is the case with English literature. A recommendation for further research is thus to survey Chinese language journals.

Another limitation of the survey is the interpretation, or better, the impact level of possible misinterpretations of the survey questions. Despite proof readings and an upfront review, information may literally get lost in translation. Conducting interviews next to surveys could provide more insight in possible interpretation issues and loopholes in the questions. Through face to face interviews the questionnaire outcomes could perhaps be improved.
Finally, a larger survey population could provide more insight. There is a vast number of manufacturers in China and given the issues the country is facing, more research should be done.

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Appendix A - Questionaire

问卷-可持续性供应管理 (Sustainable Supply Chain Management

此问卷的意图是为了更好的理解中国地区的可持续性供应管理(SSM. 我们的目的是确定可持续性是否有助于供应商选择. 这些信息的收集将帮助明确 SSM 的原因, SSM 所采用的标准, 公司所采用的绿化供应链策略, 供应商关注的可持续性特征, SSM 的管理方式, SSM 的阻碍, 益处及积极性.

The purpose of this questionnaire is to develop a better understanding of sustainable supply management (SSM in China. The objective is to determine if sustainability is currently taken into account in the suppliers' selection process as suggested by some scholars (Seuring and Muller, 2008; Ho et al.,2010. The information gathered will help us to determine the reasons for SSM, the criteria employed for SSM, the greening supply chain strategy adopted by companies, the characteristics of suppliers concern with sustainability, the managerial approaches for SSM, the barriers, the benefits and the motivation for SSM.

Any information provided will be treated confidentially. Individual responses will not be published, or otherwise disclosed.

A. 公司部分 (Company characteristics

1. 公司名称
Name of the company? (optional

2. 公司所属行业
Activities of the company? *

- [ ] 生产制造业 (Manufacturing and Process industries
- [ ] 批发 (Wholesale
- [ ] 零售 (Retail
- [ ] 银行/保险 (Banking/ Insurance
- [ ] 医药/牙科/保健 (Medical/ Dental/ Heathcare
- [ ] 运输/公共事业 (Transportation / Utilities
- [ ] 研究 (Research
- [ ] 政府 (Government
- [ ] 另外（请注明 Other (please specify:

3. 您的公司是
Your company is: *

- [ ] 独资 (Independent
- [ ] 子公司 (Subsidiary
- [ ] 国营 (National
- [ ] 外资 (International
- [ ] 另外（请注明 Other (please specify:

4. 员工人数 (Number of employees *

- [ ] <>
- [ ] 10 - 50
- [ ] 50 - 99
- [ ] 100 - 499
- [ ] 500 - 999
- [ ] 1,000 - 4,999
- [ ] 5,000 - 9,999
- [ ] 10,000+

5. Approximate Annual Gross Sales (USD
年营业额 *

- [ ] <>
- [ ] 10,000 – 24,999
- [ ] 25,000 – 49,999
- [ ] 50,000 – 99,999
- [ ] 100,000 – 499,999
- [ ] 500,000 – 1 Million
- [ ] 1 Milllion – 5 Million
- [ ] 5 Milllion – 10 Million
- [ ] 10 Milllion – 20 Million
- [ ] 20 Milllion+

6. 成立时间 (Year the company was founded: *

- [ ] <1900
- [ ] 1900 - 1949
- [ ] 1950 - 1979
- [ ] 1980 - 1989
- [ ] 1990 - 1999
- [ ] 2000 - 2009

- [ ] 2010 - 2015
- [ ] 我不知道 (don't know

B. 贵公司的可持续供应链管理 (Sustainable Supply Chain Management in your company

贵公司可持续发展的原因
(Reasons for Sustainability in your company *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
1. 高层决策 (Top Management vision	☐	☐	☐	☐	☐	☐	☐
2. 客户期望 (Customers' expectations	☐	☐	☐	☐	☐	☐	☐
3. 供应商的环保举措 (Suppliers' green initiatives	☐	☐	☐	☐	☐	☐	☐
4. 竞争对手的行动 (Competitors' actions	☐	☐	☐	☐	☐	☐	☐
5. 业务性质 (Nature of the business	☐	☐	☐	☐	☐	☐	☐
6. 政府监管要求 (Government regulatory requirements	☐	☐	☐	☐	☐	☐	☐
7. 其它组织(如非官方组织 Other Stakeholders (Such as Non-Governmental Organizations	☐	☐	☐	☐	☐	☐	☐

排序下列供应商的选择条件
(Rank the following supplier's selection criteria *

	1. 最不重要 (Least Imporant)	2. 不重要 (Unimportant)	3 不很重要 (Slightly Unimportant)	4. 中立 (Neutral)	5. 比较重要 (Slightly important)	6. 重要 (important)	7. 最重要 (Most Important)
8. 价格 (Price	☐	☐	☐	☐	☐	☐	☐
9. 服务率 (Service rate	☐	☐	☐	☐	☐	☐	☐
10. 质量 (Quality	☐	☐	☐	☐	☐	☐	☐
11. 可靠性 (Reliability	☐	☐	☐	☐	☐	☐	☐
12. 相关服务 (Associated services	☐	☐	☐	☐	☐	☐	☐
13. 交货 (Delivery	☐	☐	☐	☐	☐	☐	☐
14. 灵活性 (Flexibility	☐	☐	☐	☐	☐	☐	☐
15. 规模 (Size	☐	☐	☐	☐	☐	☐	☐
16. 可信度 (Confidence	☐	☐	☐	☐	☐	☐	☐
17. 地域 (Geography proximity	☐	☐	☐	☐	☐	☐	☐
18. 长期关系 (Long term relationships	☐	☐	☐	☐	☐	☐	☐
19. 经济从属 (Economic dependency	☐	☐	☐	☐	☐	☐	☐

	1. 最不重要 (Least Imporant)	2. 不重要 (Unimportant)	3 不很重要 (Slightly Unimportant)	4. 中立 (Neutral)	5. 比较重要 (Slightly important)	6. 重要 (important)	7. 最重要 (Most Important)
20. 个人关系 (Personal relationships	☐	☐	☐	☐	☐	☐	☐
21. 信息技术及系统 (Information technology and information system	☐	☐	☐	☐	☐	☐	☐
22. 环境系统 (Environmental issues	☐	☐	☐	☐	☐	☐	☐
23. 社会责任 (Social Responsibility	☐	☐	☐	☐	☐	☐	☐
24. 认证 (Certification	☐	☐	☐	☐	☐	☐	☐

您的供应商所涉及到的可持续发展
(Sustainable issues involving your suppliers concern *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
25. 认证 (Certification ISO14001	☐	☐	☐	☐	☐	☐	☐
26. 精益管理 (Lean Management	☐	☐	☐	☐	☐	☐	☐
27. 减污 (Waste reduction	☐	☐	☐	☐	☐	☐	☐
28. 包装精简 (Savings from packaging	☐	☐	☐	☐	☐	☐	☐
29. 产品寿命周期管理 (Product life cycle management	☐	☐	☐	☐	☐	☐	☐
30. 生态设计 (Eco-design	☐	☐	☐	☐	☐	☐	☐
31. 生产资源系统 (Production resources system	☐	☐	☐	☐	☐	☐	☐
32. 净化程序 (Clean programs	☐	☐	☐	☐	☐	☐	☐
33. 逆向物流 (Reverse logistics	☐	☐	☐	☐	☐	☐	☐
34. 减少碳足迹 (Reducing carbon footprint	☐	☐	☐	☐	☐	☐	☐
35. 绿色运输通道 (Green transportation channels	☐	☐	☐	☐	☐	☐	☐

可持续管理中的供应商特征
(What are the characteristics of suppliers involved in sustainable management *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
36. 战略供应商 (Strategic suppliers	☐	☐	☐	☐	☐	☐	☐
37. 非战略供应商 (Non-strategic suppliers	☐	☐	☐	☐	☐	☐	☐
38. 大型公司 (Large scale companies (Multi National Enterprises	☐	☐	☐	☐	☐	☐	☐
39. 中小型公司 (Small and medium sized enterprises	☐	☐	☐	☐	☐	☐	☐

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
40. 地域靠近供应商 (Geographically near suppliers	☐	☐	☐	☐	☐	☐	☐
41. 华东供应商 (East China suppliers	☐	☐	☐	☐	☐	☐	☐
42. 中西部供应商 (Central and West China suppliers	☐	☐	☐	☐	☐	☐	☐
43. 其它亚太地区供应商 (Other Asia Pacific suppliers	☐	☐	☐	☐	☐	☐	☐
44. 北美供应商 (North America suppliers	☐	☐	☐	☐	☐	☐	☐
45. 南美供应商 (South America suppliers	☐	☐	☐	☐	☐	☐	☐
46. 欧洲供应商 (European suppliers	☐	☐	☐	☐	☐	☐	☐
47. 非洲供应商 (African suppliers	☐	☐	☐	☐	☐	☐	☐

在您的公司, 可持续供应管理是
(In your company, the sustainable supply management is: *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
48. 积极的 (Pro-active	☐	☐	☐	☐	☐	☐	☐
49. 被动的 (Reactive	☐	☐	☐	☐	☐	☐	☐
50. 主动 (Active	☐	☐	☐	☐	☐	☐	☐
51. 共同的 (Collective	☐	☐	☐	☐	☐	☐	☐
52. 合作的 (Collaborate	☐	☐	☐	☐	☐	☐	☐
53. 个体的 (Individual	☐	☐	☐	☐	☐	☐	☐

可持续供应管理的主要障碍是
(The main barriers for sustainable supply management are *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
54. 财务成本 (Financial costs	☐	☐	☐	☐	☐	☐	☐
55. 投资回报率 (Return on investment	☐	☐	☐	☐	☐	☐	☐
56. 绿色投资 (Green investments	☐	☐	☐	☐	☐	☐	☐
57. 绿色诱发变化 (Green induced changes	☐	☐	☐	☐	☐	☐	☐
58. 产品价格 (Product price	☐	☐	☐	☐	☐	☐	☐
59. 产品特性 (Characteristics of the product	☐	☐	☐	☐	☐	☐	☐
60. 核心企业高层的认同 (Focal firm top management commitment	☐	☐	☐	☐	☐	☐	☐

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
61. 核心企业对可持续性的以往经验 (Focal firm previous experiences on sustainability	☐	☐	☐	☐	☐	☐	☐
62. 核心企业的设施 (Focal company facilities	☐	☐	☐	☐	☐	☐	☐
63. 核心企业的人力技能 (Focal company human skills	☐	☐	☐	☐	☐	☐	☐
64. 供应链构建 (Supply Chain configuration	☐	☐	☐	☐	☐	☐	☐
65. 供应商的地点 (Suppliers' location	☐	☐	☐	☐	☐	☐	☐
66. 供应商的规模 (Suppliers' firm size	☐	☐	☐	☐	☐	☐	☐
67. 供应商的公司文化 (Suppliers' firm culture	☐	☐	☐	☐	☐	☐	☐
68. 供应商高层的认同 (Suppliers' top management commitment	☐	☐	☐	☐	☐	☐	☐
69. 供应商的设施 (Suppliers' facilities	☐	☐	☐	☐	☐	☐	☐
70. 供应商的人力技能 (Suppliers' human skills	☐	☐	☐	☐	☐	☐	☐

可持续性供应管理的主要益处和积极性是
(The main benefits and motivation for sustainable supply management are *

	1. 十分反对 (Strongly disagree	2. 反对 (Disagree	3. 不太同意 (Slightly disagree	4. 无建议 (No Opinion	5. 些许同意 (Slightly agree	6. 同意 (Agree	7. 十分同意 (Strongly agree
71. 灵活性 (Flexibility	☐	☐	☐	☐	☐	☐	☐
72. 品质 (Quality	☐	☐	☐	☐	☐	☐	☐
73. 供应比率 (Fill rate	☐	☐	☐	☐	☐	☐	☐
74. 客户满意度 (Customer satisfaction	☐	☐	☐	☐	☐	☐	☐
75. 供应商信任度 (Trust in suppliers	☐	☐	☐	☐	☐	☐	☐
76. 订单执行成本 (Order fulfilment costs	☐	☐	☐	☐	☐	☐	☐
77. 供应商交货期 (Supplier lead time	☐	☐	☐	☐	☐	☐	☐
78. 供应商的创新能力 (Supplier's capabilities to innovate	☐	☐	☐	☐	☐	☐	☐
79. 上游供应链的危机管理 (Upstream supply chain risk management	☐	☐	☐	☐	☐	☐	☐
80. 库存下降 (Reduction of inventory	☐	☐	☐	☐	☐	☐	☐

C. 个人背景信息 (Personal Demograpic characteristics

81. 性别
(Your Gender *

- [ ] 男 (Male
- [ ] 女 (Female

82. 年龄
(Your age *

- [ ] <>
- [ ] 18-24
- [ ] 25-34
- [ ] 35-44
- [ ] 45-54
- [ ] 55+

83. 您在公司的职能
(Your function in the company *

- [ ] 供应链 (Supply Chain
- [ ] 生产运营 (Manufacturing & Operations
- [ ] 采购 (Purchasing
- [ ] 质量 (Quality
- [ ] 市场 (Marketing
- [ ] 销售 (Sales
- [ ] 财务 (Finance
- [ ] 研发 (R&D
- [ ] 执行总裁 (CEO/ Managing Director
- [ ] Other (please specify:

84. 您在公司的服务年限 (年
Your experience in the company (years *

- [ ] <5
- [ ] 5 - 9
- [ ] 10 - 14
- [ ] 15 - 19
- [ ] 20 - 24
- [ ] 25 - 29
- [ ] 30 - 34
- [ ] 35 - 39
- [ ] >=40

85. 您在此职能的年限 (年
(Your experience in the function (years *

- [ ] <5
- [ ] 5 - 9
- [ ] 10 - 14
- [ ] 15 - 19
- [ ] 20 - 24
- [ ] 25 - 29
- [ ] 30 - 34
- [ ] 35 - 39
- [ ] >=40

Appendix B – SPSS output

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
REASON1	78	3	7	6.14	.849
REASON2	78	2	7	5.83	.918
REASON3	78	4	7	5.77	.867
REASON4	78	2	7	5.55	1.052
REASON5	78	3	7	5.88	.853
REASON6	78	3	7	5.63	1.033
REASON7	78	3	7	5.35	1.067
CRITERIA1	78	3	7	6.23	.867
CRITERIA2	78	3	7	5.94	.902
CRITERIA3	78	4	7	6.29	.899
CRITERIA4	78	4	7	6.24	.856
CRITERIA5	78	3	7	5.71	.839
CRITERIA6	78	4	7	5.79	.812
CRITERIA7	78	4	7	5.86	.817
CRITERIA8	78	3	7	5.76	.928
CRITERIA9	78	2	7	5.62	1.022
CRITERIA10	78	4	7	5.54	.963
CRITERIA11	78	3	7	5.82	.908
CRITERIA12	78	3	7	5.56	.934
CRITERIA13	78	4	7	5.51	.990
CRITERIA14	78	3	7	5.94	.944
CRITERIA15	78	4	7	5.76	.942
CRITERIA16	78	4	7	5.74	.904
CRITERIA17	78	3	7	5.86	.936
GREEN1	78	4	7	5.85	.927
GREEN2	78	3	7	5.85	.884
GREEN3	78	2	7	5.58	1.038
GREEN4	78	3	7	5.69	.930
GREEN5	78	4	7	5.88	.897
GREEN6	78	3	7	5.67	1.015
GREEN7	78	2	7	5.86	.990
GREEN8	78	3	7	5.72	.979
GREEN9	78	3	7	5.53	.963
GREEN10	78	3	7	5.73	1.002
GREEN11	78	3	7	5.83	.932
SUPPCHAR1	78	4	7	5.73	.907

SUPPCHAR2	78	2	7	5.06	.998
SUPPCHAR3	78	4	7	5.87	.958
SUPPCHAR4	78	2	7	5.62	.943
SUPPCHAR5	78	3	7	5.65	.951
SUPPCHAR6	78	3	7	5.71	.927
SUPPCHAR7	78	2	7	5.36	1.248
SUPPCHAR8	78	2	7	5.13	1.177
SUPPCHAR9	78	2	7	5.22	1.364
SUPPCHAR10	78	2	7	4.88	1.432
SUPPCHAR11	78	2	7	5.31	1.342
SUPPCHAR12	78	1	7	4.74	1.454
APPROACH1	78	3	7	6.10	.906
APPROACH2	78	1	7	4.15	1.766
APPROACH3	78	3	7	6.01	.919
APPROACH4	78	3	7	5.83	.874
APPROACH5	78	3	7	6.12	.897
APPROACH6	78	1	7	4.85	1.469
BARRIER1	78	4	7	5.65	.895
BARRIER2	78	4	7	5.91	.840
BARRIER3	78	3	7	5.65	1.067
BARRIER4	78	3	7	5.47	1.113
BARRIER5	78	3	7	5.50	.964
BARRIER6	78	2	7	5.59	1.037
BARRIER7	78	2	7	5.65	1.160
BARRIER8	78	3	7	5.71	1.152
BARRIER9	78	2	7	5.53	1.090
BARRIER10	78	2	7	5.63	.941
BARRIER11	78	3	7	5.65	1.004
BARRIER12	78	2	7	5.59	1.062
BARRIER13	78	3	7	5.47	.963
BARRIER14	78	3	7	5.41	1.050
BARRIER15	78	3	7	5.41	1.025
BARRIER16	78	3	7	5.50	1.078
BARRIER17	78	3	7	5.60	.931
BENEFIT1	78	4	7	5.73	.750
BENEFIT2	78	3	7	6.00	.940
BENEFIT3	78	4	7	5.85	.898
BENEFIT4	78	3	7	6.08	.908
BENEFIT5	78	4	7	5.90	.920
BENEFIT6	78	3	7	5.62	.983
BENEFIT7	78	3	7	5.72	.910
BENEFIT8	78	4	7	5.83	.959
BENEFIT9	78	3	7	5.63	1.046

BENEFIT10	78	3	7	5.46	1.053
Valid N (listwise)	78				

Correlations

CN_SSMDATA_2015
nov_N78 Correlation.

RELIABILTIY Cronbach's Alpha

Reliability REASON variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
.822	7

Reliability CRITERIA variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
.924	17

Reliability GREEN variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
.916	11

Reliability SUPCHAR variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	N of Items
.911	12

Reliability APPROACH variables

Notes

Output Created		20-MAR-2016 12:24:15
Comments		
Input	Active Dataset	DataSet2
	Filter	<none>
	Weight	<none>
	Split File	<none>

	N of Rows in Working Data File	78
Missing Value Handling	Matrix Input Definition of Missing	 User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=APPROACH1 APPROACH2 APPROACH3 APPROACH4 APPROACH5 APPROACH6 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE CORR /SUMMARY=TOTAL MEANS.
Resources	Processor Time	00:00:00.01
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	78	100.0
	Excluded[a]	0	.0
	Total	78	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.480	.598	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
APPROACH1	26.96	11.726	.265	.524	.430
APPROACH2	28.91	9.875	.108	.494	.568
APPROACH3	27.05	11.919	.225	.414	.446
APPROACH4	27.23	10.855	.446	.537	.358
APPROACH5	26.95	11.244	.356	.580	.393
APPROACH6	28.22	9.653	.261	.452	.427

Reliability BARRIER variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.947	.946	17

Reliability BENEFIT variables
Scale: ALL VARIABLES

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.903	.904	10

Calculation of construct variables

```
COMPUTE REASON=REASON1+REASON2+REASON3+REASON4+REASON5+REASON6+REASON7.
EXECUTE.
COMPUTE
CRITERIA=CRITERIA1+CRITERIA2+CRITERIA3+CRITERIA4+CRITERIA5+CRITERIA6+CRITERIA7+CRITERIA8
+CRITERIA9+CRITERIA10+CRITERIA11+CRITERIA12+CRITERIA13+CRITERIA14+CRITERIA15+CRITERIA16+C
RITERIA17.
EXECUTE.
COMPUTE
GREEN=GREEN1+GREEN2+GREEN3+GREEN4+GREEN5+GREEN6+GREEN7+GREEN8+GREEN9+GREEN10+GR
EEN11.
EXECUTE.
COMPUTE
SUPCHAR=SUPPCHAR1+SUPPCHAR2+SUPPCHAR3+SUPPCHAR4+SUPPCHAR5+SUPPCHAR6+SUPPCHAR7+SU
PPCHAR8+SUPPCHAR9+SUPPCHAR10+SUPPCHAR11+SUPPCHAR12.
EXECUTE.
COMPUTE
BARRIER=BARRIER1+BARRIER2+BARRIER3+BARRIER4+BARRIER5+BARRIER6+BARRIER7+BARRIER8+BAR
RIER9+BARRIER10+BARRIER11+BARRIER12+BARRIER13+BARRIER14+BARRIER15+BARRIER16+BARRIER17.
EXECUTE.
COMPUTE
BENEFIT=BENEFIT1+BENEFIT2+BENEFIT3+BENEFIT4+BENEFIT5+BENEFIT6+BENEFIT7+BENEFIT8+BENEFIT
9+BENEFIT10.
EXECUTE.
COMPUTE SSM=APPROACH1*2 + APPROACH3.
EXECUTE.
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING PAIRWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT SSM
  /METHOD=ENTER REASON CRITERIA GREEN SUPCHAR BARRIER BENEFIT
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
  /SAVE MAHAL COOK.
```

Regression

Notes

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Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Correlation coefficients for each pair of variables are based on all the cases with valid data for that pair. Regression statistics are based on these correlations.
Syntax		REGRESSION /DESCRIPTIVES MEAN STDDEV CORR SIG N /MISSING PAIRWISE /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL ZPP /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT SSM /METHOD=ENTER REASON CRITERIA GREEN SUPCHAR BARRIER BENEFIT /SCATTERPLOT=(*ZRESID ,*ZPRED) /RESIDUALS NORMPROB(ZRESID) /CASEWISE PLOT(ZRESID) OUTLIERS(3) /SAVE MAHAL COOK.
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	Additional Memory Required for Residual Plots	472 bytes

Variables Created or Modified	MAH_1	Mahalanobis Distance
	COO_1	Cook's Distance

Descriptive Statistics

	Mean	Std. Deviation	N
SSM	18.2179	2.41557	78
REASON	40.1538	4.64052	78
CRITERIA	99.1667	10.42402	78
GREEN	63.1795	7.79568	78
SUPCHAR	64.2821	9.90723	78
BARRIER	94.9359	12.80558	78
BENEFIT	57.8077	6.87751	78

Correlations

		SSM	REASON	CRITERIA	GREEN	SUPCHAR	BARRIER	BENEFIT
Pearson Correlation	SSM	1.000	.576	.794	.715	.436	.538	.726
	REASON	.576	1.000	.743	.778	.700	.605	.620
	CRITERIA	.794	.743	1.000	.899	.624	.667	.813
	GREEN	.715	.778	.899	1.000	.746	.670	.824
	SUPCHAR	.436	.700	.624	.746	1.000	.566	.622
	BARRIER	.538	.605	.667	.670	.566	1.000	.704
	BENEFIT	.726	.620	.813	.824	.622	.704	1.000
Sig. (1-tailed)	SSM	.	.000	.000	.000	.000	.000	.000
	REASON	.000	.	.000	.000	.000	.000	.000
	CRITERIA	.000	.000	.	.000	.000	.000	.000
	GREEN	.000	.000	.000	.	.000	.000	.000
	SUPCHAR	.000	.000	.000	.000	.	.000	.000
	BARRIER	.000	.000	.000	.000	.000	.	.000
	BENEFIT	.000	.000	.000	.000	.000	.000	.
N	SSM	78	78	78	78	78	78	78
	REASON	78	78	78	78	78	78	78
	CRITERIA	78	78	78	78	78	78	78
	GREEN	78	78	78	78	78	78	78
	SUPCHAR	78	78	78	78	78	78	78
	BARRIER	78	78	78	78	78	78	78
	BENEFIT	78	78	78	78	78	78	78

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

1	BENEFIT, REASON, BARRIER, SUPCHAR, CRITERIA, GREEN[b]	.	Enter

a. Dependent Variable: SSM

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816[a]	.665	.637	1.45546

a. Predictors: (Constant), BENEFIT, REASON, BARRIER, SUPCHAR, CRITERIA, GREEN

b. Dependent Variable: SSM

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	298.890	6	49.815	23.516	.000[b]
	Residual	150.405	71	2.118		
	Total	449.295	77			

a. Dependent Variable: SSM

b. Predictors: (Constant), BENEFIT, REASON, BARRIER, SUPCHAR, CRITERIA, GREEN

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.438	1.706		-.256	.798	-3.840	2.964
	REASON	.030	.062	.058	.482	.631	-.094	.154
	CRITERIA	.147	.040	.634	3.673	.000	.067	.227
	GREEN	-.001	.062	-.004	-.021	.984	-.124	.122
	SUPCHAR	-.041	.027	-.167	-1.502	.138	-.095	.013
	BARRIER	-.008	.019	-.043	-.423	.674	-.047	.030

	BENEFIT	.110	.048	.314	2.303	.024	.015	.206

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	REASON	.576	.057	.033	.330	3.030
	CRITERIA	.794	.400	.252	.158	6.311
	GREEN	.715	-.002	-.001	.119	8.393
	SUPCHAR	.436	-.175	-.103	.380	2.633
	BARRIER	.538	-.050	-.029	.450	2.222
	BENEFIT	.726	.264	.158	.254	3.936

a. Dependent Variable: SSM

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	REASON	CRITERIA	GREEN	SUPCHAR	BARRIER
1	1	6.966	1.000	.00	.00	.00	.00	.00	.00
	2	.012	24.143	.37	.00	.00	.00	.35	.00
	3	.009	28.481	.26	.02	.00	.00	.16	.42
	4	.006	33.859	.12	.00	.04	.05	.16	.47
	5	.005	39.301	.09	.58	.00	.00	.17	.03
	6	.002	58.020	.02	.39	.15	.15	.01	.06
	7	.001	81.277	.14	.00	.80	.79	.16	.01

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions
		BENEFIT
1	1	.00
	2	.00
	3	.04
	4	.06
	5	.18
	6	.72
	7	.00

a. Dependent Variable: SSM

Casewise Diagnostics[a]

Case Number	Std. Residual	SSM	Predicted Value	Residual
69	3.333	21.00	16.1494	4.85063

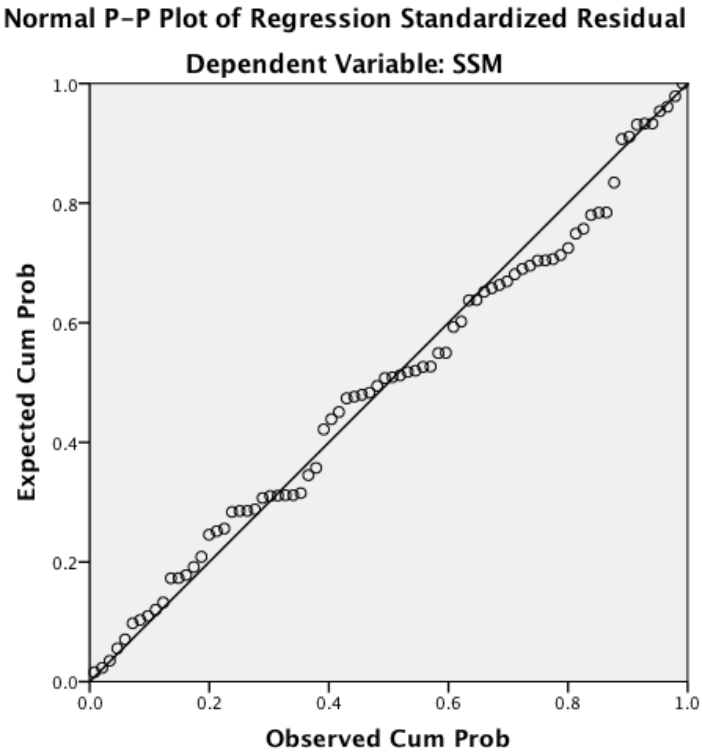
a. Dependent Variable: SSM

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	12.1400	22.3429	18.2179	1.97020	78
Std. Predicted Value	-3.085	2.094	.000	1.000	78
Standard Error of Predicted Value	.209	.879	.408	.156	78
Adjusted Predicted Value	12.2629	22.9014	18.2256	1.95928	78
Residual	-3.12800	4.85063	.00000	1.39761	78
Std. Residual	-2.149	3.333	.000	.960	78
Stud. Residual	-2.206	3.556	-.002	1.012	78
Deleted Residual	-3.36749	5.52322	-.00770	1.56047	78
Stud. Deleted Residual	-2.270	3.895	.002	1.037	78
Mahal. Distance	.598	27.079	5.923	5.884	78
Cook's Distance	.000	.279	.018	.044	78
Centered Leverage Value	.008	.352	.077	.076	78

a. Dependent Variable: SSM

Charts


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: SSM
Expected Cum Prob
Observed Cum Prob
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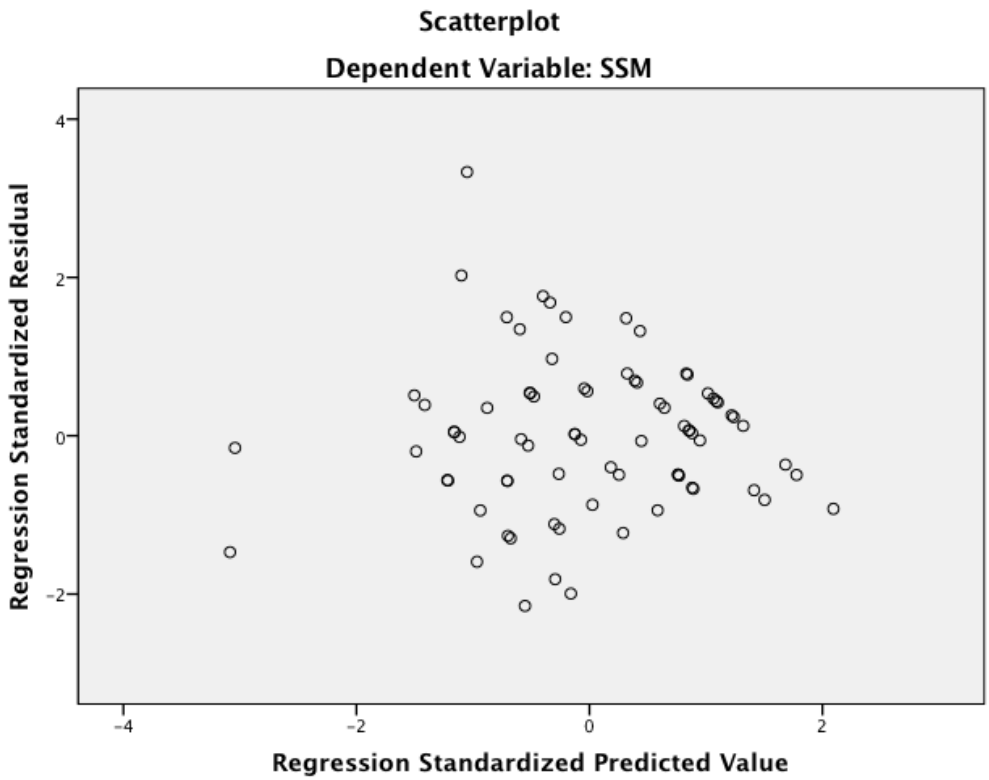
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: SSM
Regression Standardized Residual
Regression Standardized Predicted Value
4
2
0
-2
-4

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING PAIRWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT SSM
  /METHOD=STEPWISE REASON CRITERIA GREEN SUPCHAR BARRIER BENEFIT
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS NORMPROB(ZRESID)
  /SAVE MAHAL COOK.
```

Regression

Notes

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	Split File	<none>
	N of Rows in Working Data File	78
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Correlation coefficients for each pair of variables are based on all the cases with valid data for that pair. Regression statistics are based on these correlations.

Syntax		REGRESSION /DESCRIPTIVES MEAN STDDEV CORR SIG N /MISSING PAIRWISE /STATISTICS COEFF OUTS CI(95) R ANOVA ZPP /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT SSM /METHOD=STEPWISE REASON CRITERIA GREEN SUPCHAR BARRIER BENEFIT /SCATTERPLOT=(*ZRESID ,*ZPRED) /RESIDUALS NORMPROB(ZRESID) /SAVE MAHAL COOK.
Resources	Processor Time	00:00:00.40
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	Memory Required	10480 bytes
	Additional Memory Required for Residual Plots	472 bytes
Variables Created or Modified	MAH_2	Mahalanobis Distance
	COO_2	Cook's Distance

Descriptive Statistics

	Mean	Std. Deviation	N
SSM	18.2179	2.41557	78
REASON	40.1538	4.64052	78
CRITERIA	99.1667	10.42402	78
GREEN	63.1795	7.79568	78
SUPCHAR	64.2821	9.90723	78
BARRIER	94.9359	12.80558	78
BENEFIT	57.8077	6.87751	78

Correlations

		SSM	REASON	CRITERIA	GREEN	SUPCHAR	BARRIER	BENEFIT
Pearson	SSM	1.000	.576	.794	.715	.436	.538	.726

Correlation	REASON	.576	1.000	.743	.778	.700	.605	.620
	CRITERIA	.794	.743	1.000	.899	.624	.667	.813
	GREEN	.715	.778	.899	1.000	.746	.670	.824
	SUPCHAR	.436	.700	.624	.746	1.000	.566	.622
	BARRIER	.538	.605	.667	.670	.566	1.000	.704
	BENEFIT	.726	.620	.813	.824	.622	.704	1.000
Sig. (1-tailed)	SSM	.	.000	.000	.000	.000	.000	.000
	REASON	.000	.	.000	.000	.000	.000	.000
	CRITERIA	.000	.000	.	.000	.000	.000	.000
	GREEN	.000	.000	.000	.	.000	.000	.000
	SUPCHAR	.000	.000	.000	.000	.	.000	.000
	BARRIER	.000	.000	.000	.000	.000	.	.000
	BENEFIT	.000	.000	.000	.000	.000	.000	.
N	SSM	78	78	78	78	78	78	78
	REASON	78	78	78	78	78	78	78
	CRITERIA	78	78	78	78	78	78	78
	GREEN	78	78	78	78	78	78	78
	SUPCHAR	78	78	78	78	78	78	78
	BARRIER	78	78	78	78	78	78	78
	BENEFIT	78	78	78	78	78	78	78

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	CRITERIA	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	BENEFIT	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: SSM

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	.626	1.47693
2	.806[b]	.650	.641	1.44745

a. Predictors: (Constant), CRITERIA

b. Predictors: (Constant), CRITERIA, BENEFIT

c. Dependent Variable: SSM

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	283.514	1	283.514	129.973	.000[b]
	Residual	165.781	76	2.181		
	Total	449.295	77			
2	Regression	292.161	2	146.080	69.724	.000[c]
	Residual	157.134	75	2.095		
	Total	449.295	77			

a. Dependent Variable: SSM

b. Predictors: (Constant), CRITERIA

c. Predictors: (Constant), CRITERIA, BENEFIT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.037	1.610		-.023	.982	-3.243	3.170
	CRITERIA	.184	.016	.794	11.401	.000	.152	.216
2	(Constant)	-.424	1.589		-.267	.790	-3.590	2.742
	CRITERIA	.139	.027	.601	5.126	.000	.085	.193
	BENEFIT	.084	.041	.238	2.032	.046	.002	.166

Coefficients[a]

Model		Correlations		
		Zero-order	Partial	Part
1	(Constant)			
	CRITERIA	.794	.794	.794

2	(Constant)			
	CRITERIA	.794	.509	.350
	BENEFIT	.726	.228	.139

a. Dependent Variable: SSM

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	REASON	-.031[b]	-.295	.769	-.034	.448
	GREEN	.004[b]	.027	.979	.003	.191
	SUPCHAR	-.098[b]	-1.101	.275	-.126	.611
	BARRIER	.014[b]	.150	.881	.017	.555
	BENEFIT	.238[b]	2.032	.046	.228	.339
2	REASON	-.040[c]	-.385	.701	-.045	.447
	GREEN	-.129[c]	-.766	.446	-.089	.166
	SUPCHAR	-.152[c]	-1.709	.092	-.195	.572
	BARRIER	-.064[c]	-.649	.519	-.075	.478

a. Dependent Variable: SSM

b. Predictors in the Model: (Constant), CRITERIA

c. Predictors in the Model: (Constant), CRITERIA, BENEFIT

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	12.0836	21.9991	18.2179	1.94789	78
Std. Predicted Value	-3.149	1.941	.000	1.000	78
Standard Error of Predicted Value	.168	.764	.266	.100	78
Adjusted Predicted Value	12.4473	22.0649	18.2259	1.92313	78
Residual	-3.20771	4.76738	.00000	1.42853	78
Std. Residual	-2.216	3.294	.000	.987	78
Stud. Residual	-2.256	3.416	-.002	1.011	78
Deleted Residual	-3.32453	5.12770	-.00792	1.50100	78
Stud. Deleted Residual	-2.321	3.692	.001	1.033	78
Mahal. Distance	.051	20.481	1.974	3.003	78
Cook's Distance	.000	.370	.018	.054	78
Centered Leverage Value	.001	.266	.026	.039	78

a. Dependent Variable: SSM